SCIENTIFIC AMERICAN

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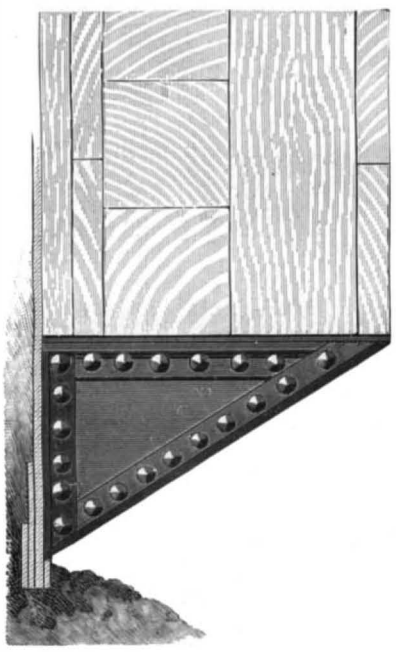
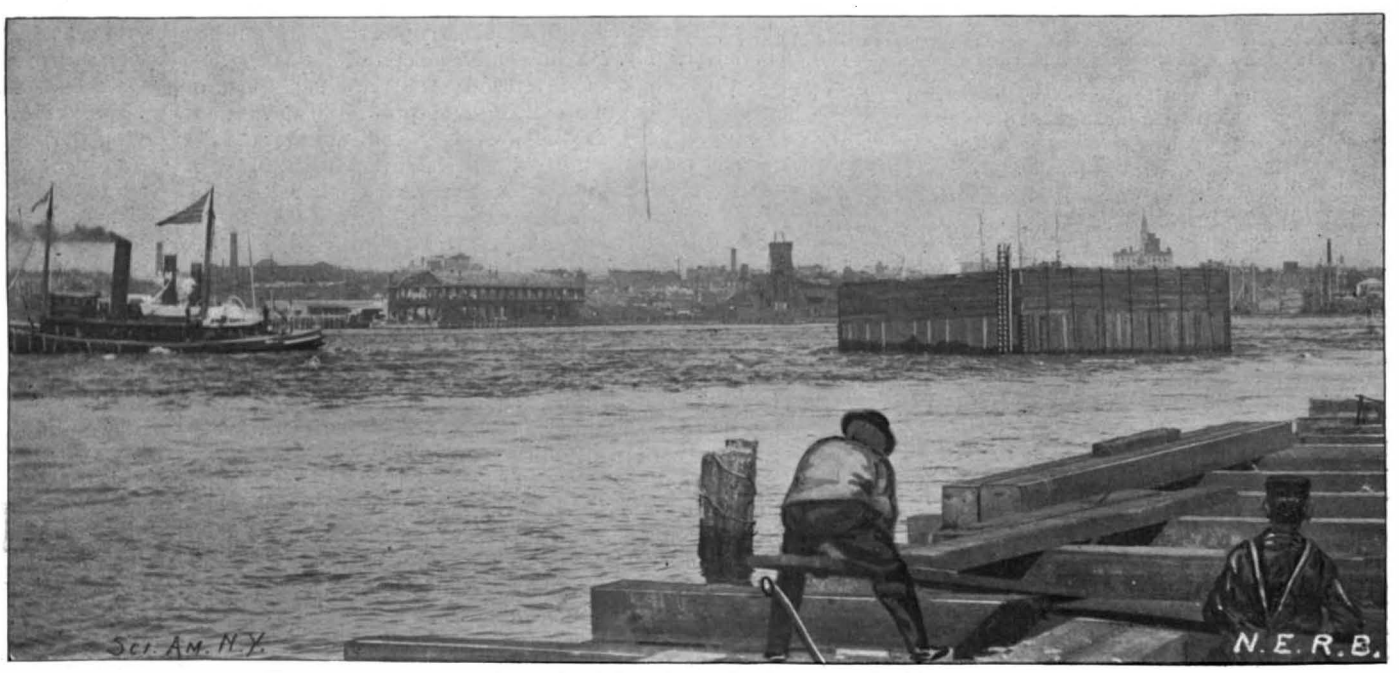
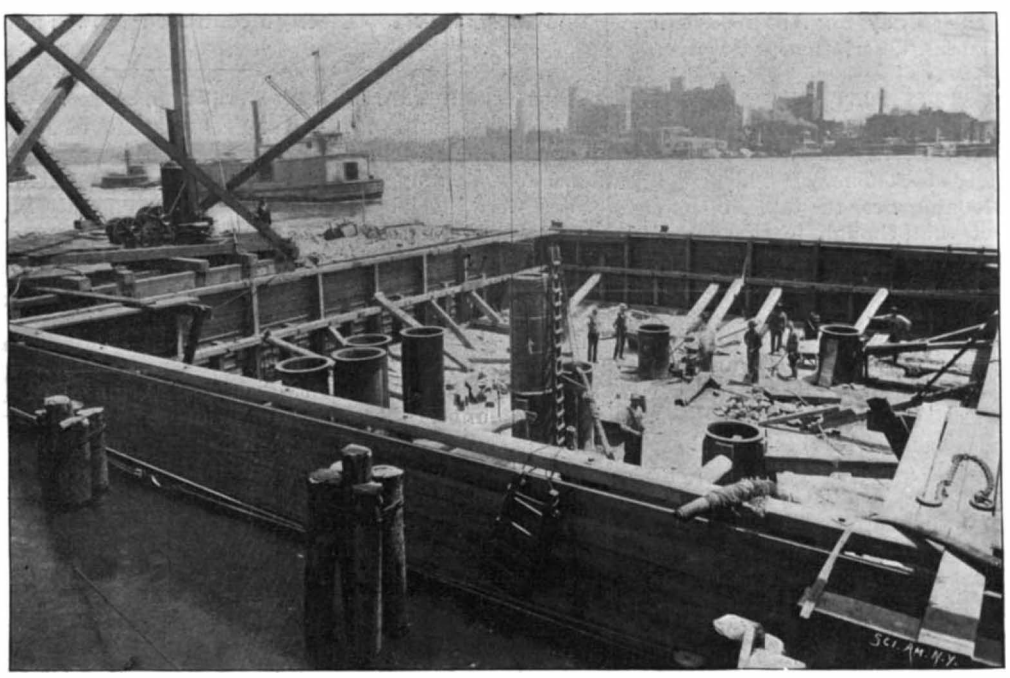


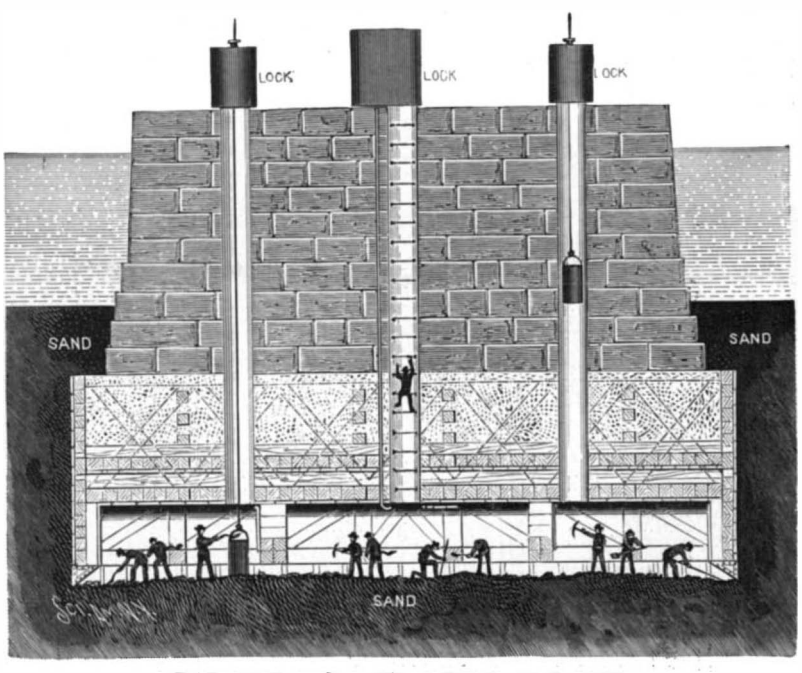
THE CUTTING EDGE.



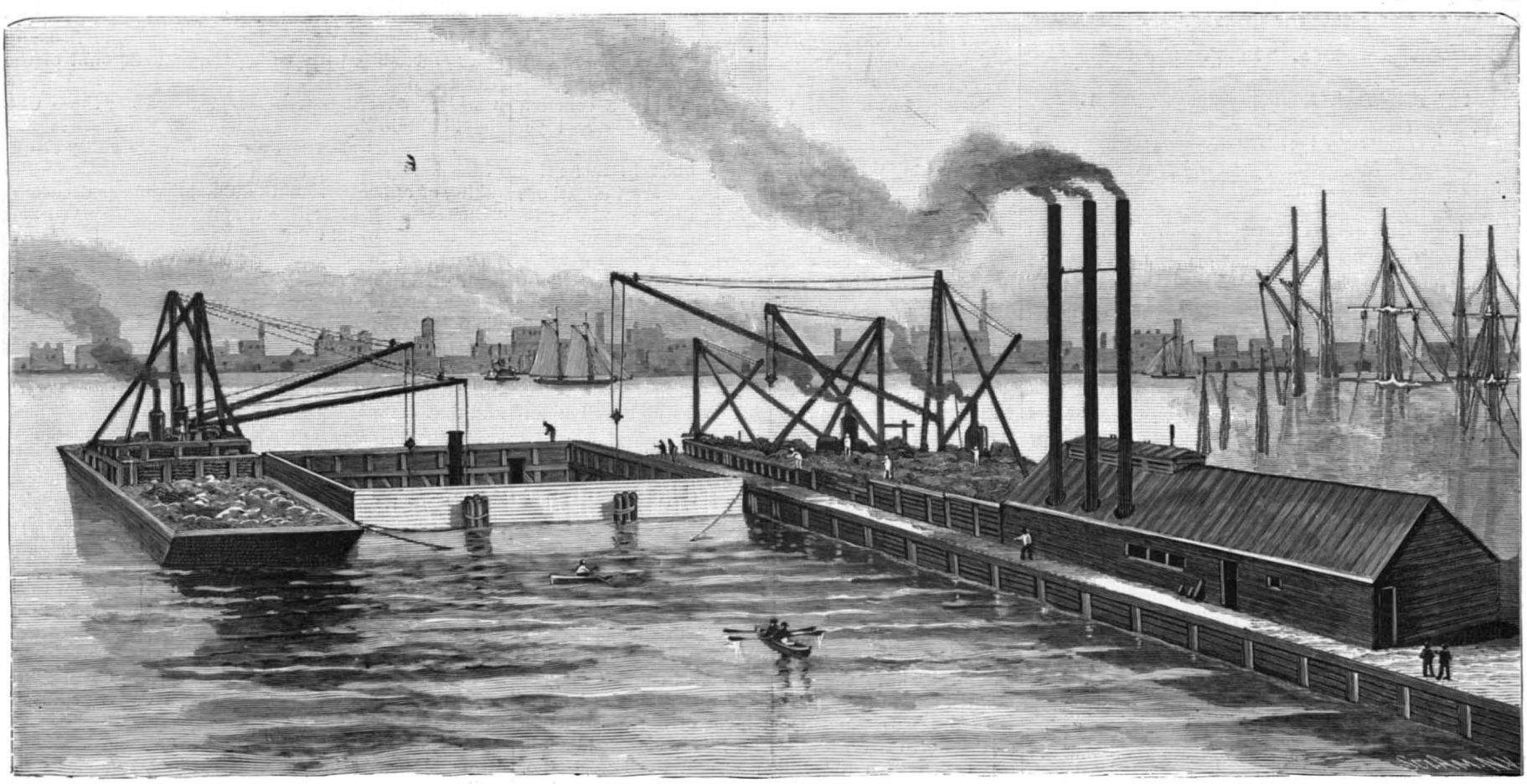
TOWING THE CAISSON TO SITE OF BRIDGE.



CAISSON IN POSITION, WITH TEMPORARY COFFERDAM ATTACHED.



SECTIONAL VIEW OF CAISSON AND PIER.



VIEW OF CAISSON AND PLANT FOR NEW EAST RIVER BRIDGE.—[See page 90.]

Scientific American.

ESTABLISHED 1845

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NEW YORK, SATURDAY, AUGUST 7, 1897.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

Scientific American Supplement

No. 1127.

For the Week Ending August 7, 1897.

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APPEAL IN THE CORDITE CASE REJECTED.

It is not the less regrettable, because expected, that the appeal of the Maxim-Nordenfelt Guns and Ammunition Company against the judgment delivered by the English courts in the celebrated Cordite case has gone against the appellants. The judgment was given in such strong and explicit terms that it is scarcely to be expected that the Maxim-Nordenfelt Company will carry the case to any higher court. Whatever may be the technical merits of the case thus concluded between Mr. Maxim and the English government—and to our mind they lie entirely with the former—it must be generally admitted that the decision is a distinct "hardship," as it has been termed by a prominent English journal, upon the distinguished inventor. Mr. Maxim's smokeless powder was not one of that class of inventions that are suggested or prompted by some existing and profitable device. It was produced as the necessary counterpart of the Maxim rapid-fire gun, in experimenting with which it was found that the ordinary powder produced such a dense volume of smoke as to make it impossible to see the target. The smoke of the old powders, which was merely an inconvenience when the interval between shots was measured by minutes, became a positive obstruction when the interval was reduced to seconds. Mr. Maxim set out to produce a smokeless powder, and the result of a long series of costly experiments was the smokeless powder maximite. It was by a mere rearrangement of the proportions of maximite and the substitution of a constituent which differed from the one replaced, as was proved by its experts' own testimony at the trial, merely in name, that the English government succeeded in producing cordite—a powder which has never shown the stability possessed by maximite, and only recently exploded in large quantity during some tests at the government proving grounds. It is certainly a hardship that after so many years of toil and expense the inventor should see the largest share of the material fruits of his labors, estimated by Mr. Maxim at several million dollars, snatched away from him on a legal technicality of the flimsiest description.

THE COMMERCE OF THE PORT OF NEW YORK.

There is food for thought and not much room for encouragement in the pages of the last report issued by the New York Chamber of Commerce. The first thing that is apparent in looking over the tables of imports and exports is the fact that, though in the preceding decade the volume of trade had been growing at a steady and rapid pace, in the present decade it has remained about stationary, the totals for 1896, indeed, being somewhat less than those for 1891. In view of the fact that the trade of the whole country that crosses the Atlantic seaboard is steadily increasing, this stagnation will come as a surprise to those citizens of New York who have never believed that it could possibly have a successful competitor as the great port of entry for the United States. The facts, however, are indisputable. What are the causes? One of these, to which we drew attention in a recent issue, is to be found in the difficult entrance to New York Harbor, and its inadequate depth as compared with the rapidly increasing size and draught of the large freighters which are being built for the American trade. It was only yesterday that a freight steamer of from 5,000 to 7,000 tons was considered to be exceptionally large, yet to-day we have a vessel plying regularly between this port and Europe which has a displacement of over 23,000 tons, and draws from 29 to 32 feet of water. A winding channel, with a mean depth of 30 feet, will be a constant menace to the safety of vessels of this class, and yet the present indications are that on account of their great earning power they will be built in increasing numbers in the near future. There are indications, however, that this difficulty is in a fair way to be removed, and surveys are now in progress looking to the creation of a 35-foot channel with a minimum width of 1,000 feet.

A more serious check to the commercial prosperity of this port—more serious because it is even now actively in operation—is the costly handling which most of the freight has to undergo between rail and ship when it reaches the Hudson River. New Yorkers who speak with some degree of pride of the vast and well organized system of lighterage on the East and North Rivers forget that, however well it may be carried out, this transfer by lighters is a heavy handicap upon New York in its competition with other Atlantic ports where the cars unload directly into the ship's hold. It is a well recognized fact among railroad men that the cost of handling is relatively far greater than the cost of haul, and this explains the fact that the mere transfer at New York figures as a far larger item in a through rate from Buffalo than the expense of the journey by rail. Although it is not our intention at this time to enter fully into the question of remedies, it may be pointed out, in passing, that just here is found one of the strongest arguments in favor of the construction of the North River bridge; for this structure, taken in connection with a belt line around the lower end of Manhattan Island, and the proposed railroad bridge across the East River, would enable a train load of freight to be shipped from interior points and landed at any pier in New York and Brooklyn.

In its report to the Chamber of Commerce on improving the dock facilities of the port of New York the committee on the harbor and shipping mentions the following disabilities under which the port is laboring: A lack of proper and sufficient wharves and docks; exorbitant charges by the city; the requirement that steamship lines shall build their own sheds, which revert to the city at the expiration of the lease; that steamship lines have to pay for the dredging of the docks; and that there is a movement on foot to subject to taxation the very sheds for which the city practically receives rental, which the lessee never really owns, and which must revert to the city at the end of the lease.

On the face of it these appear to be very severe conditions, and viewed in the presence of the fact that competing ports are pursuing a very liberal policy toward steamship companies, the New York methods would seem to be almost suicidal.

Coupled with the above, which might be called the internal difficulties of the situation, are others of an external nature in the shape of discrimination by the trunk railroads in favor of other ports such as Baltimore, Philadelphia, and Boston. Freight can be shipped by rail to these ports for from 2 cents to 5 cents per hundred pounds less than it can to New York. Moreover, the railroads make an extra charge of 2½ cents per hundred pounds, or $6 per car, on each car load of produce from Chicago to Europe by way of New York that has more than one bill of lading—a charge that is not made on freight through any other port. The injustice of this discrimination is too glaring to call for any comment. On the whole, it is satisfactory to note that every one of the evils above mentioned is remediable, and it is to be hoped that the rude awakening which has come to the business men of the metropolis as to the fancied commercial impregnability of the port will result in energetic measures to remove every stumbling block to the city's continued growth and prosperity.

ALLEGED FRAUDULENT PATENT BUSINESS.

As announced in the SCIENTIFIC AMERICAN of June 26, proceedings looking to the debarment of Wedderburn & Company from practice before the Patent Office were officially begun in Washington July 24, Assistant Commissioner A. P. Greely having been designated by Commissioner Butterworth to hear the evidence. The government was represented by Examiner F. W. Winter and Law Clerk Charles C. Stauffer, and the defendants by Judge Jere M. Wilson, William L. Ford and William H. Bond. The trial was begun with the presentation by the government of a large amount of documentary evidence which had been carefully arranged and alphabetically assorted. The charges are said to have contained many specifications of unprofessional methods pursued by the defendants, and to have cited cases of alleged fraudulent practice, Examiner Winter going over the evidence and claiming to have abundant proofs to sustain all the charges. "There were," said Mr. Winter, "devices submitted to this office by Wedderburn & Company that were unpatentable and upon which no two men could differ, all tending to bring the department into bad repute, the defendants in such cases excusing their failure to obtain patents for their clients by casting reflections upon the department," the clients in many cases proceeding with patent cases "on account of the prizes held out to them by the defendants," as part of a widely advertised scheme of awards for those who should obtain the greatest number of patents. It was also charged that the defendants were guilty of unprofessional practice in their advice to clients on the taking of appeals from the Commissioner's decisions, "thus securing large fees that were not deserved and were unfairly obtained."

In regard to searches, or preliminary examinations conducted in the Patent Office on the part of the defendant firm for their clients, to determine the probable patentability of an invention, one witness declared that he was employed by the defendants as a searcher, though he was known to be "without experience in the patent business or with mechanics or inventions," and that he was instructed to "report favorably" on cases which he "could not understand, or that seemed very complicated." This witness also mentioned several cases on which he was instructed to report favorably without any search. Other witnesses testified to similar effect.

On the part of the defendants it was claimed that they had always endeavored to practice before the department in an upright and honest manner; that they had not defrauded a single client; that they had always instituted a careful investigation in the office records before accepting fees or applying for patents, and that their offer of prizes was merely for the purpose of "stimulating the dormant inventive genius of Americans."

The trial is likely to be somewhat prolonged. It has attracted great attention in legal circles, and is necessarily of great importance to all who have business

with the Patent Office. That a firm of patent attorneys doing a large business should be specifically charged with the offenses here made the subject of a trial is not only calculated to reflect discredit upon all trustworthy practitioners, but is a matter of serious concern to all who believe that the progress of inventions is facilitated and greatly promoted by our patent system.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The forty-sixth annual meeting of the association is to be held in the city of Detroit, Mich., on Monday, August 9, and is to continue to August 14.

The place of the meeting is the spacious Detroit high school building, having a large auditorium, near which are several class rooms where the different sections will meet.

The meeting on the first day in the morning will be given up to the organization of the several sections. In the afternoon at the different rooms the following papers are announced to be read by the respective vice presidents: in physics, "Long Range Temperature and Pressure Variables," by Carl Barus; in anthropology, "The Science of Humanity," by W. J. McGee; in geology and geography, "The Pittsburg Coal Bed," by I. C. White; in mathematics and astronomy, "A Chapter in the History of Mathematics," by W. W. Beman; in social and economic science, "Improvident Civilization," by Richard T. Colburn; in chemistry, "Sanitary Chemistry," by W. P. Mason; in botany, "Experimental Morphology," by George F. Atkinson; in mechanical science and engineering, "Applied Mechanics," by John Galbraith; in the zoological section L. O. Howard will read a paper in place of Prof. Goode, who died during the year.

The general session will meet in the evening in the auditorium, when a memorial address on the life and work of the late president, Edward D. Cope, will be given by Prof. Theodore Gill, of Washington, D. C.

On August 10, 11, 12 and 13 there will be meetings of the general session in the morning and of the sections in the afternoons. On Saturday, August 14, a complimentary excursion is arranged to inspect the United States ship canal in Lake Ste. Claire Flats.

About the same time or shortly after, the British Association of Science will hold its annual meeting in Toronto, and there is to be a visitation of members of the American Association and a general interchange between the members of both associations. The meeting of this year promises to be full of interest to all who are able to attend.

PREPARING FOR CIVIL SERVICE EXAMINATIONS.

The recent action of President McKinley, requiring removals to be for cause only after proper examination of complaints in a large number of positions under the government, gives greater importance to the matter of civil service examinations, the whole scope of which is yet but partially apprehended by the general public. The qualifications required and the nature of the questions to be asked of one who desires to qualify for any of the offices which have thus been opened to public competition may be learned without difficulty, but in large numbers of cases the applicant does not realize the absolute necessity there is of proper preparation until he fails to pass the examination. The National Correspondence Institute, of Washington, D. C., organized in 1893, undertakes to prepare applicants for examination on the correspondence plan, in this way drilling them in just the line of information and knowledge they will be required to possess in any particular place for which they apply. The Institute is conducted by a combination of specialists familiar with the classifications made in the different departments of the public service, and its scope is so extended that it undertakes even to prepare applicants for examination for the position of examiner in the Patent Office. The position is not an easy one to obtain, the examination embracing physics, technics, mathematics and mechanical drawing and chemistry, but the course of instruction by correspondence, as carried on by the Institute, is arranged to prepare an applicant for this as well as any of the other numerous positions open to public competition.

THE AUTOMOBILES RACE IN FRANCE.

Under the auspices of the Figaro and the Journal des Sports, the race for automobile vehicles between St. Germain and Dieppe, a distance of 170 kilometers (105 miles), was run on July 24. The weather was splendid and the roads were in perfect condition. The organization of the race was perfect, mounted gendarmes keeping order at the start. Fifty-six competitors were checked at the start alone, and others left at a later hour. Nearly all forms of the horseless carriage were represented, and some of them carried as many as six passengers. The race took place under the most successful conditions throughout the whole length of the course. Crowds of people eagerly waiting for them were at the towns and cities through which the vehicles passed. The start was made promptly at nine o'clock, and the competitors were expected at Dieppe any time after one o'clock. Unfortunately, the special train which left St. Germain at the same time as the automobiles only arrived twelfth at Dieppe, the engine breaking down beyond Rouen. As might naturally be expected, the motorcycle arrived first, that of M. Jatin reaching Dieppe in 4 h. 13 m. 33 s. The motorcycle of M. Pellier arrived 4:43:55. The first horseless carriage to arrive was that of MM. De Dion et Bouton, which arrived in 4 h. 18 m. 34 s. The second to arrive was the carriage of M. Gilles Hourgieres, the time being 4:36:00. M. Gilles Hourgieres wins the first prize for carriages of two seats and MM. De Dion et Bouton won the prize for the carriage with four seats. The race was free from incidents and there were no accidents of any importance. The Paris-Dieppe race of 1897 is considered to be the most successful one which has ever been held. This is largely owing to the excellence of the arrangements in regard to the race.

PROF. LIBBEY CONQUERS THE MESA.

In our issue of June 19 we described the preparations which Prof. William Libbey, of Princeton University, had made to scale the "Mesa Encantada," which is near the Indian village of Tacoma, in New Mexico. Prof. Libbey was entirely successful in his efforts and reached the top of the famous height. By means of a 2½ inch brass cannon he succeeded in throwing a cord over the crest of the Mesa, and by means of this cord the ropes required in making the ascent were pulled up. Fifteen hundred feet of rope was required to reach from one side to the other, and when all was in readiness a traveling block was attached to the pulley which had previously been spliced to the main rope, and pulled up to the edge of the overhanging ledge. A chair was then rigged on the traveling block and it was filled with pieces of rock which equaled the weight of a man. This was then sent up to the crest of the ledge, and the experimental trip was found to be entirely successful. Prof. Libbey then took his place in the chair and was raised to the top of the Mesa. All that was found at the top which indicated that it might have been inhabited was a monument of rocks which looked as if it were erected by man. With this exception, there were absolutely no indications that it had ever been inhabited, so that there is now authoritative proof that there is absolutely no ground for the romantic legends which have always clung about this mysterious table land.

THE CURIOUS DEATH OF A WHALE.

The white whale which was brought from Canadian waters to the New York Aquarium on June 5 died on July 24, of œdema of the lungs. On July 23 one of the keepers noticed that something was wrong with the whale, as he was attracted by the loud wheezing that accompanied each blow the whale made when he came to the surface for fresh air. It was thought that the lungs of the whale had become diseased, but it was afterward found out that some foreign substance had got into the blowhole, and one of the keepers found a piece of eel floating on the surface of the water. The true cause of the whale's trouble was then found. It was discovered that a piece of an eel was hanging from the blowhole. The water was at once drawn off from the tank, but this did not save the whale, which died in the evening. The whale's blowhole was examined after his death, and what appeared to be part of an eel was found protruding from it. One of the men started to pull this out, and he pulled until he got to the end of an eel about two feet long, which had become partially digested in the whale's stomach. The eel was preserved in alcohol.

A whale is obliged to come to the surface every ten seconds to blow. There is a valve in the blowhole which works very rapidly as the whale exhales the impure and inhales the fresh air. The whale Seltzer took the whole eel into the air passage, thus preventing the air valve from closing tightly. By continued wheezing he pushed more and more of the eel upward, thus opening the air valve wider. Finally the valve became so open that the water rushed in and flooded the lungs, and Seltzer drowned.

PULUJ'S PHOSPHORESCENT LAMP.

Puluj, the Austrian scientist, some fifteen years ago invented what he called a phosphorescent lamp, but, as it seemed a sort of imitation of Crookes and Geisler, it did not attract attention. He has, however, been pushing forward with the idea. The lamp is lighted by means of an induction coil or a glass plate electric machine. The static electricity thus produced is the same in every respect as lightning. The lamp can be operated even though only one terminal of the induction coil (the negative pole, for instance) is connected to it. The lamp itself is shaped very much the same as an ordinary Edison incandescent lamp, except that the wires leading into the lamp do not extend up the neck from a socket. They extend directly through the side of the bulb. They are made of aluminum. The negative pole of cathode ends in a small reflector-shaped disk. Hanging from the point or apex of the lamp globe is a small square sheet of mica. The piece of mica faces the reflector disk or negative pole, and is painted with sulphide of calcium, an extremely phosphorescent substance. When the negative pole of the lamp is connected with an induction coil, the current is, as it were, concentrated by the little disk in the lamp, and a stream of radiant electricity flows from it to the painted sheet of mica, which immediately glows with an intensely brilliant phosphorescent light. This is Puluj's lamp as it is at present, but it is not, in its present stage, available for general lighting purposes. Puluj is experimenting with a view to arriving at a solution of this problem. He is carrying on a series of investigations to the end of producing a chemical lighting system. Not the production of light through the consumption of chemicals, but, as far as can be learned, the development of ethereal light vibrations by chemical means.—Photography.

THE PARTHENON INSCRIPTION DECIPHERED.

Mr George S. Horton, United States consul at Athens, Greece, has just transmitted to the State Department at Washington a most interesting report regarding the deciphering of an inscription on the architrave of the east end of the Parthenon. The face of the eastern architrave is thickly dotted with small holes, and for many years scholars have been under the impression that these holes were the traces of nails which had once held fast the letters of an inscription. It had also been suggested from time to time that a study of the nail holes might give some clew as to the letters themselves, which long ago were torn down, doubtless for the sake of the metal which they contained.

The difficulty of such a task, which has defied the archæologists until now, is at once evident. The architrave is about 100 feet long, and the holes extend over 90 feet of its length. They dot thickly spaces from 3 to 4 feet in length, between which are circular blanks, where shields about 4 feet in diameter hung at fixed intervals.

Various attempts have been made, chiefly by German archæologists, to read the nail holes. The most notable of the methods employed have been photography and transcribing with the aid of magnifying glasses. No attempts met with any success until Eugene Plumb Andrews, of the American School of Classical Studies at Athens, hit upon a practical method. He threw a rope over the eastern end of the ruined building and pulled up a rope ladder. Then he suspended a swing in front of the architrave 37 feet from the marble step below, and took what is known as a "squeeze" of the holes. His method was ingenious. Damp "squeeze" paper was first applied to the surface of the stone and patted well down with a brush. The paper broke through over the holes. Mr. Andrews then poked extra strips into each of the openings and lapped their ends down on the large sheet. When he had thus treated all the holes, he laid another sheet over the first, to hold the ends of the strips in place, and pounded all together into one solid sheet, on which the exact position of the nail holes was represented by protuberances or nipples. The time required in making these squeezes, twelve in number, was about one and a half months. The twelve squeezes represented the twelve spaces between the shields. He then arranged them in order and began studying. His greatest difficulty occurred at the start, for the reason that he did not know whether the inscription ran straight across all the squeezes or whether the squeezes were to be read separately, as the pages of a book. Moreover, the ancient workman who had nailed up the letters had made numerous mistakes, so that many of the holes were treacherous and confusing.

Mr. Andrews, however, persisted and light began to dawn. He found, for instance, that three holes placed thus ∴ indicated either a △ or a ∧ the metal letter having been nailed at its three corners, and that three holes placed thus ⁘ showed where an O had been nailed. He made a transcript of the squeezes on a long strip of paper, marking the locality of the protuberances with dots, and then attempted to form the ancient letters by drawing lines from dot to dot. Finally he deciphered the word "Autokratora," which proved that the inscription had been Roman, and not, as formerly supposed, of an earlier date. The word "Nerona" threw further light on the matter. Here was evidently the dedication of a statue to the Emperor Nero, and the reading was simplified by a study of other similar inscriptions, as the same phraseology is used in all, much the same as in modern legal language.

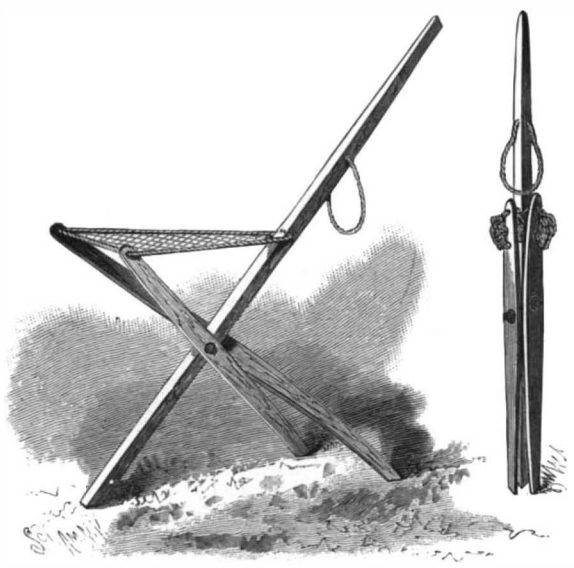
The inscription translated is substantially as follows:

"The council of the Areopagus and the council of the 600 and the people of the Athenians erect this statue of the very great Emperor Nero Cæsar Claudius Sevastos Germanicus, the Son of God, during the generalship over the hoplites for the eighth time of Claudius Novius, the overseer and lawgiver, son of Philenous, during the priestess-ship of ——, daughter of ——."

It appears, therefore, that the inscription recorded the erection of a statue to Nero, probably in the Parthenon. As it is known from another inscription that Claudius Novius was general for the eighth time in the year 61 A.D., we have the exact date of this inscription.

A NOVEL FOLDING CHAIR.

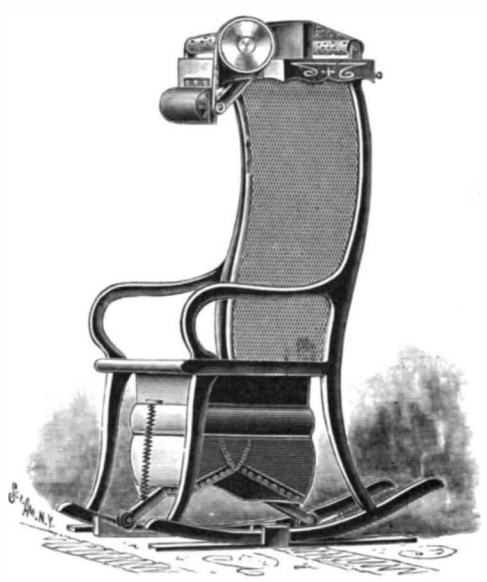
The illustration represents a folding chair whose back is a continuation of one of the legs, the parts being adapted to be folded and carried after the manner of a walking stick, as shown in the smaller figure. The chair may thus be taken into a railroad car or in a crowd of people much as a cane or umbrella would be carried, or it may be borne on the arm by a loop in its back provided for that purpose. It has been patented by John H. Hortman, of No. 323 Rutherford Avenue, Trenton, N. J. The leg forming the back is triangular in cross section, and the other two legs are pivoted on its side faces. The seat is formed of netting or a flexible fabric attached to a marginal rope or cord whose ends are secured in the back leg, and at two side faces of the latter, near the bottom, are studs or projections which engage the other legs when the parts are folded together.



HORTMAN'S FOLDING CHAIR.

A ROCKING CHAIR WITH FAN AND MUSIC BOX.

The illustration represents a rocking chair provided with an air-compressing device adapted to deliver a current of air for cooling the occupant of the chair, for sounding a music box or for any purpose for which compressed air may be applied. A patent has been granted for the improvement to Charles J. Michaelson, of No. 5 Elmwood Avenue, Charleston, West Va. Beneath the chair seat are two bellows, having the usual valves, and discharging into a receiver above, the lower portions of the bellows being extended to form arms with rollers which run on a bar beneath the chair, the bar having upwardly inclined ends, and the arms being normally depressed by springs. As the chair rocks, therefore, the air is forced into the receiver, from which a tube leads into a small compressed air reservoir at the top of the chair back, and in this reservoir is a passageway with reeds and adapted to be used as a music box. The music box is operated in the usual way, and is covered by a sheet of perforated paper wound on rollers, one of which has a pulley operated by a belt from a pulley which carries a fan, upon which air is discharged from the reservoir. The music box may be detached, if desired, and the blast of air be turned directly upon the occupant of the chair. The compressed air may, otherwise, be conveyed by tubes to any point where it is desired to use compressed air for other purposes.



MICHAELSON'S ROCKING CHAIR.

DRIVING away mice from infected cellars is said to be successfully accomplished by woolen rags soaked in oil of turpentine and placed in front of the holes by which mice enter.

Flying Without Wings.*

BY C. F. HOLDER.

One of the most interesting sights one observes in Southern California waters is a flock of flying fishes in the air; not one or two, but often fifty or one hundred, ten or twenty feet from the water, lifted by the wind and whirling away like quail or a flock of insects, scintillating in the sunlight—a startling picture. The fish appear to be flying, but they are simply one variety of many animals which apparently fly without wings. The writer has had these fliers pass within a foot of his face, and has known several persons who have been struck by them; but while the fishes dash through the air and cover distances of an eighth of a mile out of water, they are not strictly fliers, as they have no power to move the wings, as in legitimate flight. The wings are merely enormously developed fins, the pectorals resembling wings, with powerful branches or veins, the anals being smaller. The fish, then, has not four wings in the strict acceptation of the word, but four wing-like fins which it holds firmly, and which serve as sails or parachutes, bearing it up against the current which it forms as it rushes along. In this way these fish fly or soar for long distances.

In the Gulf of Mexico there is a fish known as the flying gurnard, a really magnificent creature, which bounds into the air when alarmed, spreading its wide pectoral fins and darting away like some gorgeous insect. It has vivid colors of blue, purple, and red, while its large winglike fins sparkle and gleam in the sun as though they were inlaid with gems. This flier possesses a singular armor, its head being incased in bone, so that a blow from the fish in its headlong flight through the air is liable to result seriously. There are instances known of men being knocked down and stunned by them.

Certain fishes have the faculty of propelling themselves into and through the air in other ways. Such is the large gar of the South Pacific, which, when alarmed, bounds from the water by a twist of its tail and goes whizzing away, a living arrow and a dangerous one. When the ship Challenger made her famous trip around the world, the naturalists on board had many opportunities to observe the flier without wings. One struck the cap of an officer, and several instances came to the notice of the naturalists of fishes which had struck natives who were wading in the water, inflicting fatal wounds.

The most perfect fliers without wings are found among the mammals and reptiles. One of the lizards has a peculiar frill connecting its limbs; this frill is braced by a series of false ribs. When the lizard wishes to escape from some enemy, it darts into the air and soars away downward, upheld for a long distance by the side wings, which are boomed out by the false ribs. The little animal now resembles a large dragon fly, its rich metallic colors and tints flashing in the sunlight. On it rushes, making a graceful curve, rising and grasping the trunk of a tree, when it seems to disappear, so close is the protective resemblance. If still followed by some bird enemy, it will repeat the action, continually dipping down and rising, ultimately escaping.

The flying squirrel well illustrates this curious faculty of soaring like a bird. Its fore and hind limbs are connected by a web of flesh that hangs in a wrinkle when the animal is at rest, and would not be noticed; but the moment the little creature darts into the air and moves away, the pure white parachute, winglike arrangement is seen. It catches the wind or rushing air as the squirrel bears down, and seems to expand and extend outward, taking the little flier safely upward, and enabling it to cross long distances and reach another point of vantage.

The flying lemur is one of the largest and most remarkable examples of this device of nature. Here not only are the limbs connected by a web, but the tail and hind legs are booms for a fleshy, furlined sail, so that the lemur, with its young clinging to it, leaps boldly into the air and darts away, swooping down with great velocity, rising again to grasp a branch or trunk, to rush to the topmost bough and launch itself again into space. In this way a lemur will, if followed persistently, cover miles in a forest, and as a rule escape its enemies. The grace, ease, and facility with which these flights are made is more than remarkable. The animal has but to extend its limbs, as one intuitively does in diving or swimming, and plunge down into space.

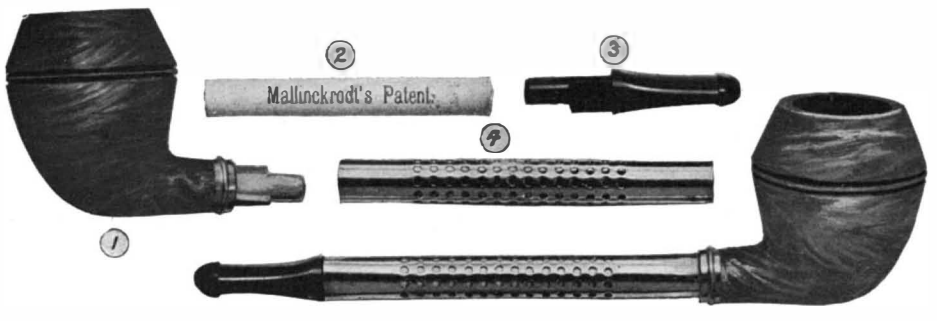
The islands of Sumatra and Borneo have produced some remarkable fliers of this kind. A party of explorers in passing through a forest one day saw what they supposed to be a bird swooping down from a limb. A native was sent in pursuit of it, but the creature rose at the end of its flight and alighted upon a tree, up which it seemed to crawl, then flung itself into the air again. It was finally captured after a long chase, proving to be a large tree toad. Instead of wings it had large elastic webs between its toes, which caught the air as it dashed away, buoying it up and acting as parachutes. The feet of the animal resembled those of a gull or a duck, so far as the webs were concerned, the four little parachutes offering surface sufficient to bear up the animal in its long flights from tree to tree.

A spider with a flying or soaring apparatus has been discovered. On each side of the abdomen extends a triangular lobe which catches the wind when the spider leaps into the air, aiding its flight to some extent, and well illustrating this remarkable method of flying without wings.

*In the Outlook of July 17.

A NICOTINE ABSORBENT VENTILATED TOBACCO PIPE.

Users of tobacco in the form of pipe smoking do not need to be told of the annoyance and vexation frequently experienced by the clogging of the pipe, from the accumulation of moisture, nicotine, and impurities at the base of the bowl and in the stem. The pipe thus not only becomes strong and foul, greatly impairing the real flavor of the tobacco, but it is difficult to keep it lighted, and much of the asserted unhealthfulness of smoking and its offensiveness to non-smokers doubtless come from these causes. An improvement forming the subject of three different patents, and designed to obviate these difficulties, is illustrated herewith, the improved pipes being made in various popular designs by the Harvey & Watts Company, of Philadelphia, Pa. The bowl, 1, is connected with the mouthpiece, 3, by a perforated metallic central stem portion, 4, inside of which is placed an absorbent blotting paper tube, 2. The absorbent tube is made of fourteen layers of interleaving blotting paper, and the perforated stem allows the free circulation of cold air around the paper tube, thus evaporating all moisture and cooling the smoke, the nicotine being condensed upon and absorbed by the blotting paper. When the paper tube becomes saturated, which may be in from one to three weeks, according to the practice of the smoker, a new tube is inserted, which may be done without soiling one's fingers, thus cleaning and renovating the pipe. A package of tubes is furnished with each pipe, and fresh supplies may be obtained as desired. Eminent physicians recommend this improved pipe as taking away from smoking its most deleterious effect and rendering it a harmless enjoyment.



THE MALLINCKRODT NICOTINE ABSORBENT TOBACCO PIPE.

Transparency of Ebonite.

In a note to the Academie des Sciences, of Paris, last April, M. Perrigot showed that plates of ebonite are transparent, and that the phenomena attributed to what M. Gustave le Bon calls "black light" are explained by the fact of photographic inversion. Since the above date M. Perrigot has resumed these researches, in surrounding himself with the minutest precautions, with perfectly polished plates of ebonite 0·5 mm. in thickness and with Carbutt films. The ebonite appeared to act after the manner of a colored screen. If, in fact, we examine a thin plate of ebonite exposed to an intense pencil of white light, the eye perceives a feeble light in which orange red radiations prevail. In resuming the experiments described in his first note, but in making use of orthochromatic plates particularly sensitive to red and yellow, M. Perrigot always obtained the same results, but notably more marked. He adds that plates 2 mm. in thickness do not appear transparent to the eye, but that they still transmit the photographic impression, particularly when plates sensitive to red are used. Besides, if the author's first experiments are repeated with plates of ebonite 2 mm. in thickness, and an intense light, such as that of the sun or of electricity, be employed, the same results, either inverse or direct, are obtained, according as the photographic plate has or has not received a previous exposure.

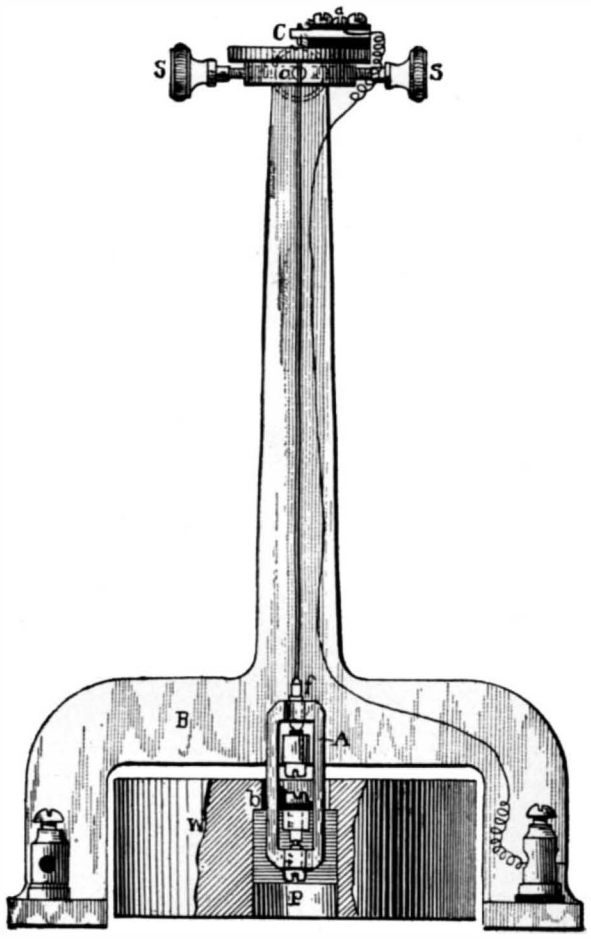
The conclusion reached by M. Perrigot is, according to him, in perfect concordance with the experiments described by M. H. Becquerel in a recent memoir, in which the author speaks of M. Le Bon's "black light" as the "pretendue lumiere noire" due to radiations the principal properties of which have been well known for fifty years.

THE MARVIN SEISMOGRAPH.

BY EMMA V. TRIEPEL.

Resting upon a square stone firmly embedded in the floor beneath the southwest corner of the main building of the Weather Bureau's headquarters at Washington, D. C., is a seismograph, the only instrument in the United States by which the time and duration of earthquakes can be recorded.

This machine may be described thus: A heavy lead



THE MARVIN SEISMOGRAPH.

weight, W, is pivoted to a short steel link, A, by means of a screw, b, the sharp point of which is just above the center of gravity of the weight, so that the latter will balance and remain stable on the pointed support. The top of the link hangs from a small projection from the frame of the instrument, B, being held in place by a second sharp pointed screw. A slender flexible needle, f, about six inches long extends straight upward from the topmost edge of the link, and its platinum tipped point normally passes exactly through the center of a platinum rimmed hole in an insulated metallic plate which is held stationary with the frame of the instrument.

One pole of an electric circuit connects with the needle at the pivot, and the opposite pole is fastened to the metallic plate. A seismic shock causes the needle tip to strike the platinum rim of the above mentioned hole, thus completing the circuit and being transmitted to the recording instrument in another building.

This register is a revolving cylinder which moves by clockwork and makes one revolution every six hours. A broad band of paper cross ruled with heavy hour lines, between which the space is subdivided by finer five minute lines, passes around the cylinder. Pressing against the moving paper ribbon is a small arm, tipped with a fountain pen, which is so controlled by the clock as to make a spiral line upon the recording sheet for seven days, without changing. The clock, which keeps standard time, is connected with the arm in such a manner that the pen is made to move every hour, thus making points in the otherwise even line. An electromagnet on the base of the register, which is connected with the pen arm, is connected electrically with the seismograph; when, therefore, the circuit is closed by the needle being jarred from its normal position so as to touch the platinum rim, the vibration is indicated by offsets, in the spiral line, between those regularly made.

The time of such disturbance is ascertained by counting the hours since the revolution began, as indicated by the points regularly made, then the five minute lines exceeding the last hour point, and then applying a delicately graduated scale for the seconds and fractions thereof. Finally, any error in the clock which drives the cylinder is determined by comparison with a pendulum clock which is regulated by telegraphic signals from the Naval Observatory. The duration is indicated by the number of successive lateral strokes made in the tracing by the fountain pen.

This seismograph was invented by Prof. C. F. Marvin, and has registered six earthquakes during its four years' service, that of May 31 being most pronounced. It is so situated that only a tremor of the earth itself can affect it, but although its utility for recording the time and duration of seismic shocks has been fully demonstrated, it does not indicate their direction, being in that respect inferior to many instruments now in use in Japan.

Scientists are anxious to have accurate seismographs placed in all the observatories throughout the country, believing that with a network of such apparatus, carefully installed, such phenomena could be observed upon a broader scale than ever before within the world's history.

A HORSELESS BROUGHAM.

In the SCIENTIFIC AMERICAN for March 13, 1897, we illustrated the hansom cab of the Electric Carriage and Wagon Company, of Philadelphia and New York; we now show the Morris & Salom brougham. It is just about to be put in operation in New York City. The hansom cabs in New York are giving great satisfaction and are in constant use, and it is expected that the brougham will be as popular as the hansom.

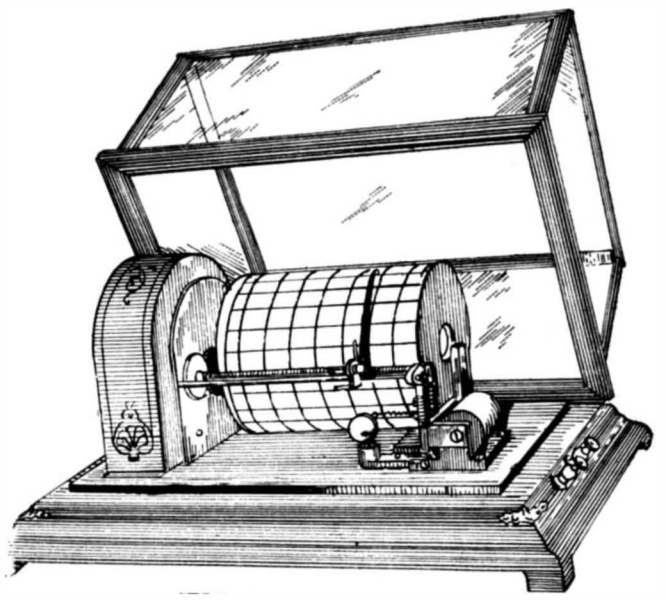
It embodies many features considered of great importance, the principal one being what is known as the "Tracteur" principle, and consists in mounting the motors, gears and batteries on the front truck or axle, thus maintaining back of the battery line all of the features of standard carriage construction, the body part of the brougham being built on precisely the same line as those intended to be drawn by horses. It is evident that this principle adapts itself to the construction of all sorts of carriages, such as landaus, victorias, cabriolets, opera coaches, etc. The new brougham is provided with 2 horse power Londell motors and a battery of 44 3 F. elements of the Electric Storage Battery Company. The motors are wound for 900 revolutions per minute and gear directly with a single reduction to the internal gears on the 36 inch driving wheels. As the motors are independent, the differential action in turning is obtained without the necessity of countershaft with balance gears. Motors are mounted on the axle and swing radially about the same; and are supported on the opposite side by spiral springs attached to the body.

The accumulators have a capacity of 100 ampere hours each, making the total battery capacity about 12 horse power hours, which is amply sufficient, owing to a very high efficiency of the motors and the means of the transmission of power, to drive the vehicles fully twenty-five miles under ordinary street conditions. On asphalt pavements and small gradients thirty-six miles have been run without recharging. The average speed is six miles per hour. The wheels are of the wire suspension type, fitted with brass hubs and ball bearings and pneumatic tires of three inch section. The steering is accomplished by moving the rear wheels in parallel planes by means of a lever placed on the right hand of the driver. The controller is placed under the driver's seat and is operated by a small lever with the left hand, it being arranged so as to permit of three speeds ahead and one back. The carriage is elegantly finished and has luxurious fittings, and weighs very little more than the horseless hansom cab.

A HORSELESS BROUGHAM.

Superstition of a Well-Known Writer.

There are many persons who have a superstition regarding figures, and who believe in their influence, good or bad, upon the events, important or unimportant, of their existence. The eminent writer, M. Emile Zola, is numbered among such. Quite recently, while he was going down Rue de la Chaussee d'Antin, at Paris, he was knocked down by a hack, which passed over his legs, without, fortunately, doing any other



SEISMOGRAPH RECORDER.

damage than bruising him. M. Zola has a superstitious horror of the number 17. This number is to him unlucky. After he arose, he looked at the number of the hack, added up the figures in a flash, and found the total to be 17. The great writer had, for a long time, held the belief that the number 17 had a malign influence upon him, and that aggravated the case.

Dr. Tolouse has recently devoted a volume to a study of M. Zola, in which he character, temperament, and the very sources of the illustrious writer's talents are analyzed with all the resources of psychology and physiology. On pages 251 and 252 of this book, the author says:

"Thus, certain figures have a bad influence upon M. Zola. If the number of a hack, when added up, forms this figure, he will not engage the vehicle, or, if he is obliged to do so, will fear that some misfortune may happen to him. For example, that he may not succeed in the business that he has started out to do. Such superstitious idea may supervene apropos of any of his arithmomaniacal impulses. For a long time the multiples of 3 appeared favorable to him; but now it is the multiples of 7 that reassure him. Thus, in the night, it often happens that he will open his eyes seven times in order to prove to himself that he is not going to die. On the contrary, the number 17, which recalls to him a sorrowful date, seems to him to be unlucky, and chance has ordained that he should recognize a coincidence of certain unfortunate occurrences with that date. Similar superstitious ideas exhibit themselves outside of all arithmomania. Thus, he will perform certain acts with the idea that, if he does not do so, some annoyance will happen to him. So he will touch the gas burners that he meets with in the streets, surmount an obstacle with the right foot, walk upon the pavement in a certain way, etc. For a long time he feared that he would not succeed in the proceeding that he was going to undertake unless he started out of the house with his left foot foremost." — La Vie Scientifique.

THE American X Ray Journal is a monthly journal devoted to practical X ray work and allied arts and sciences. The June issue contains a number of interesting radiographs, but we regret to notice a newspaper story about an English lady who lost her diamond ring in the dough of a cake. She did not discover the loss until the baking was complete, and rather than sacrifice her production or run the risks of having her guests swallow her ring, she sent the cake to an X ray studio, the ring being located by the shadowgraph without spoiling the form of the cake, and the extraction was readily accomplished. This very improbable story undoubtedly originated in the brain of some reporter.

The Number of Physicians and Medical Schools in the United States.

An interesting statistical article on the medical colleges, physicians, etc., of the United States, based on the last edition of Polk's Medical and Surgical Register and the census of 1890, appears in the Virginia Medical Semi-Monthly of recent date.

According to the above authority, the ratio of physicians of all kinds in the United States is about one to six hundred and thirteen of the population. This estimate is based on a population of sixty-five millions, and one hundred and six thousand of the physicians are thought to come under the head of "regular," while twenty-six thousand represent the eclectic, homeopathic, physio-medico, and other sects, together with professional quacks and irregulars in general. They are distributed throughout the Union in the various States and Territories as follows:

State.	Population.	No. of physicians.	Ratio of population.
Alabama	1,513,017	1,609	1: 940.3
Alaska	32,052	5	1:6.410.0
Arizona	59,620	95	1: 638.1
Arkansas	1,128,179	1,841	1: 558.5
California	1,208,130	3,152	1: 383.4
Colorado	412.198	918	1: 449.0
Connecticut	746,258	1,139	1: 666.9
Delaware	168,493	239	1: 704.5
Dist. of Columbia.	230,392	857	1: 264.2
Florida	391.422	764	1: 512.3
Georgia	1,837.353	2,021	1: 909.5
Idaho	84,385	109	1: 772.3
Illinois	3,826,351	7,331	1: 521.9
Indiana	2,192,404	4,778	1: 458.8
Indian Territory	172,321	291	1: 592.3
Iowa	1,911,896	3,400	1: 562.4
Kansas	1,427,096	2,210	1: 645.6
Kentucky	1,858,635	3,104	1: 598.8
Louisiana	1,818,587	1,460	1: 766.2
Maine	661,086	1,164	1: 567.9
Maryland	1,042,390	2,003	1: 520.4
Massachusetts	2,238,943	4,032	1: 555.2
Michigan	2,093,889	3,730	1: 561.3
Minnesota	1,301,826	1,576	1: 826.0
Mississippi	1,289,600	1,397	1: 943.3
Missouri	2,679,184	4,736	1: 565.7
Montana	132.159	247	1: 575.5
Nebraska	1,058,910	1,595	1: 663.8
Nevada	45,761	48	1: 953.3
New Hampshire	376.530	669	1: 562.6
New Jersey	1,444,933	1,844	1: 783.5
New Mexico	153,593	97	1:1,584.5
New York	5,997,853	11,132	1: 538.7
North Carolina	1,617,947	1,358	1:1,191.4
North Dakota	182,719	203	1: 900.1
Ohio	3,672,316	7,575	1: 484.7
Oklahoma	61,834	326	1: 189.7
Oregon	313,767	653	1: 480.5
Pennsylvania	5,258,014	8,439	1: 623.0
Rhode Island	345,506	543	1: 536.3
South Carolina	1,151,149	1,060	1: 991.7
South Dakota	328,808	364	1: 903.4
Tennessee	1,767,518	3,079	1: 574.0
Texas	2,235,523	4,617	1: 484.2
Utah	207,905	254	1: 818.5
Vermont	332,422	626	1: 531.0
Virginia	1,655,890	1,978	1: 847.3
Washington	349,390	650	1: 537.5
West Virginia	762,794	1,236	1: 536.4
Wisconsin	1,686,880	1,974	1: 854.9
Wyoming	60,705	60	1:1,011.7

The medical schools number about one hundred and seventy-five. Of these one hundred and twenty are regular, nineteen homeopathic, seven eclectic, two physio-medico, and twelve unclassified. Eight are for women specially; five of these being regular, two homeopathic, and one eclectic. In eight of the other colleges women are permitted to matriculate, and four are exclusively for colored people.

Statistical Research and Methods.

The Royal Statistical Society held the first meeting of the session 1896-97 in the theater of the Royal United Service Institution at Whitehall, London, November 17, when the inaugural address of the president, Mr. John Biddulph Martin, on "Some Developments of Statistical Research Methods During Recent Years," was delivered.

It was pointed out, says the Colliery Guardian, that the existence of the society was practically synchronous with the duration of her Majesty's reign. Ample material was now available for statistical treatment which at the commencement of that period was nonexistent. Among subjects of this kind might be mentioned the statistics of railway locomotion as well as the statistics of steam tonnage, which last had furnished matter for papers covering a space of four decennial periods, contributed to the society by Mr. John Glover. Electric locomotion was already beginning to furnish matter to be dealt with statistically, and it was impossible to say what might be the result during the next sixty years of the application of science to the service of man. It was conceivable that by that time some of the problems of aerial navigation would have been solved. Even the art of cycling, usually regarded as a pastime, was already beginning to exercise an economic influence. It was for the statistician to discriminate between the ephemeral phenomenon and the inception of an economic movement, and to present essential facts in a well digested form for the consideration of the economist.

Passing to the more limited period during which Mr. Martin had been connected with the society, he thought that he would be justified in laying before the society a résumé of the information which he had been enabled to collect by the kindness of numerous correspondents abroad, whom he wished specially to thank. He then proceeded to show the increased attention which had been devoted, both at home and abroad, to statistics under the following heads: (1) The increased attention bestowed on the collection of statistics by various governments; (2) the increased pursuit of statistical inquiry by private societies, whether, as in some cases, purely statistical in their aims, or, as in others, politico-economic; (3) the increased attention given to education and training in statistics, either at the initiative of government or at that of independent educational bodies. The information furnished to him showed that under all these three heads a marked impulse had been given to the pursuit of statistical inquiry. It could not be denied that the numerical method of statistical inquiry as applied to social and economic phenomena was an implement of the highest value and the most delicate temper. It was for statisticians to see that it be not used in any but a strictly workmanlike manner. Cases had occurred in which it had been willfully misused; misuse through carelessness was more frequent, and an imperfect statement of facts had in many cases led to divergent views on certain social problems.

Reference was made to the paper contributed by Monsieur A. de Foville to the jubilee meeting of the society, on the subject of "Statistics and its Enemies." Among such enemies were the laborious compilers of figures which were of no value when obtained. The statistician, so called, who aimed at minute accuracy in figures which it was impossible to estimate save approximately, was another of such enemies. A third class was composed of those who were ready to state in absolute figures the quantity and value of the imports and exports of Central Africa, or the tonnage statistics of Timbuctoo. Of faulty or fraudulent statistical returns willfully made there was nothing to be said. They not infrequently led to their own detection. It was through extravagances of this kind that Monsieur Thiers defined statistics as the art of stating in precise terms things which one does not know. The true statistician, if he would be justified of his pursuit, must learn to discard the superfluous, the imperfect, and the false, and to come under the definition which describes him as the man who can reason as well as count.

The next portion of the address dealt with the graphic method of statistics with reference to the various forms of expressing statistical totals by geometrical figures, accompanied in some cases by the employment of colors. It was to be regretted that the use of the graphic method, which had sprung up automatically, had not been developed on any conventional lines. Were the employment of particular graphic forms invariably applied to the exposition of the same phenomena, and if this conventional agreement could be made international, the interpretation of statistics graphically presented would be vastly facilitated, and might also serve to exchange ideas more efficiently than the illusive Volapuk, of which so much had been expected and by which so little had been achieved.

Reference was next made to the application of the higher mathematics and the laws of probability to the elucidation of statistical problems, and, next in order, an historical account of the development of the idea of index numbers was given. The most recent inquiry into this elaborate subject had been made by a very strong committee, consisting entirely of members of the Statistical Society, appointed at the British Association of 1886. This committee had held frequent meetings, and had reported annually until 1890. The labors of the committee resulted in a draft proposal for a government commission, which should watch and record the fluctuations in prices, and publish at frequent intervals an adjusted standard of value. It was, however, doubtful whether public opinion was yet ripe for such a sliding scale in contracts extending over a series of years. While the committee on index numbers aimed at establishing, on a sufficient series of individual averages, one comprehensive average of the price of all commodities, it was sufficiently difficult to establish a simple average. One eminent statistician raised a voice of warning against large figures; another warning voice bade "beware of averages"! The question of averages had been under the consideration of the society on more than one occasion. The difficulty of allowing for all disturbing elements was admitted.

In conclusion, the president said that he was not ashamed to confess that the scope of statistical inquiry was essentially utilitarian. The papers read before the society from time to time must not be considered as limited to the exposition of the problems with which they dealt, but their ultimate object was to show how the body politic would be affected by the advance of industrial enterprise or applied science. Abstract science, save as it bore on the improvement of the human race, had no interest for statisticians. The humanitarian aims of the society had been placed on record in an eloquent passage of the presidential address of the late Dr. Guy. Dr. Guy's views still held good. No improvement in the condition of society could be hoped for as long as the essential facts which make it such as it is at any point of time are imperfectly known or inadequately appreciated. It was for society patiently to investigate essential facts, not to be led astray by any incomplete data or preconceived theories, but to keep a true balance, and to give proper weight to all concomitant circumstances or countervailing influences. Truth must be followed fearlessly wherever it might lead. It must be the object of the fellows of the society to hand on to their successors the torch of knowledge that had been intrusted to them by those who had gone before, and to maintain in the future the prestige which had been deservedly won in the past.

The Number of Living Animal Species.

For the benefit of the curious, as well as the zoological student, the following table, from the American Naturalist, gives the census of the animal kingdom as known in the years 1830, 1881, and 1896. The first two columns are taken from a note by A. Günther, in Annals and Magazine of Natural History, and the last from a note in the Zoologist. The last was compiled in February, 1896, by the contributors to the Zoological Record.

	1830	1881	1896
Mammalia	1,200	2,300	2,500
Aves	3,600	11,000	12,500
Reptilia	443	2,600	4,400
Batrachians	100	800	
Fishes	3,500	11,000	12,000
Tunicata	..	..	900
Mollusca	11,000	33,000	50,000
Brachiapoda	..	..	150
Bryozoa	..	..	1,800
Crustacea	1840 1,200	7,500	20,000
Arachnida	1,400	8,000	10,000
Pycnogonida	8	70	
Myriapoda	450	1,300	3,000
Protracheata	..	..	
Hexapoda	49,100	220,150	230,000
Vermes	412	6,090	6,150
Echinodermata	230	1,843	3,000
Cœlenterata	1834 500	2,200	2,000
Spongiæ	1835 50	400	1,500
Protozoa	305	3,300	6,100
	71,588	311,553	366,000

The Polar Problem.

A discussion took place at a recent meeting of the Royal Geographical Society on the North Polar problem. Sir Clements Markham, president of the society, who occupied the chair, introduced the subject in a comprehensive address. He was disposed to regard the whole line of heavy ancient ice pressing upon the shore of the American continent, of the Parry Islands, and of the northern side of Greenland as evidence of a continuous drift from the eastern to the western hemispheres, across an ocean uninterrupted by land of any magnitude. The presence of warmer water in the depths of Nansen's polar sea was an important discovery. It commenced 100 fathoms below the surface, and extended down to 250 fathoms. There was still much to be learned. An expedition should be sent up to Jones Sound to connect the 400 miles between Prince Patrick Island and Aldrich's farthest, and to examine the line of ancient ice in that unknown region. Another expedition should complete the examination of the northern side of Greenland. A third, equipped on Nansen's plan, should commence the drift much further to the eastward, and pass over the Pole itself. This would probably occupy four years, but it would bring a further installment of knowledge respecting the depths of the ocean, the current, and temperatures of the vast unknown area, and another series of magnetic observations. It should also decide the question of the existence of land between Prince Patrick and Wrangel Islands.

Dr. Nansen, opening the discussion, said they could have great certainty in saying that the Pole must be situated in the deep sea basin. He thought perhaps there were some small islands to the north, where the ice drift closed in from time to time in order to get into the layers which were noticed. If it did not form into layers somewhere, he did not think it would take such a time as it did to drift across the polar region. The oldest ice he saw in the polar region was probably of five or six years of age. The ice which he saw was on an average from ten feet to twelve feet deep, and he did not believe the ice of the polar sea would freeze any thicker. He did not think it was difficult to reach the Pole itself. If they cared for it, they could reach it in one summer. If they took 200 dogs, they could reach it quite certainly, but he did not think it was worth while; he could not see the importance of it, for they would not bring back sufficient observations, and it would be a waste of time and labor. If they wanted scientific observations from the Arctic regions, there was no better plan than the one he adopted—of going into the ice. The ship was an excellent observatory. Sir J. Hooker, Sir Leopold McClintock, Sir G. Nares, and other speakers followed.

Correspondence.

Conversion of Knots to Miles.

To the Editor of the SCIENTIFIC AMERICAN:

Having experienced difficulty in appreciating distances given in knots, in the many allusions to maritime matters in the newspapers, your correspondent set to work to find a simple rule for converting them into miles. So far as he knows the following method has not appeared before, and it may interest some of your readers.

To the given number of knots add one-tenth and one-half of one-tenth of that number, and the result will be the number of miles very nearly. For example: Let the given number of knots be 20, then 20+2+1=23 miles. If the exact distance is required, add 8 feet for each mile. Thus the exact distance in the example is 23 miles and 184 feet. WM. W. BLACKFORD.

Lynnhaven, Va., July 14, 1897.

[To convert knots into miles, multiply the knots by 1·1516.—ED.]

Prolific Strawberry Growth.

To the Editor of the SCIENTIFIC AMERICAN:

As you sometimes publish notices of things extraordinary in horticulture line, I send you a photograph of some berries which I raised this spring. They are known as the "Bowker." The cluster contains sixteen matured berries and two that were not; the center berry of this particular group measured seven inches in circumference. I picked one larger than this. It measured eight inches in circumference. It was a common thing to pick berries all through the patch that measured five and a half and six inches. Unlike most large berries, they are solid, sweet and fine flavored, also fewer seeds than most berries. I took great pains in making the bed on which these berries grew. Last July I took one thousand two and a half inch flower pots to my old bed, set them in ground flush with surface and filled them with native earth. I then laid the runners on top, securing them by placing small stones or chips, whichever happened to be the handiest. About the last of August I took a pair of scissors and clipped them from the parent vine. I then took up the pots and carried them to where I wanted to plant them. After first wetting the ground, I dug a hole sufficiently large to place them, then tapped the bottom of the pots. There was a solid ball of roots in every pot. After placing the roots in the ground I packed the earth solidly around them. The plants never showed any evidence of the change. About the first of December I covered all the plants with a good coat of stable manure. I would also state that, before I placed plants in ground, I sprinkled about a tablespoonful of bone meal around each plant.

I have raised a great many berries, but never saw so many grown on one stem before. I send you a photograph of the largest of them. C. F. CURRIE.

The Psychic Influence of the Night Season.

Dr. A. B. Richardson, of the Columbus State hospital, Ohio, contributes an interesting article on this subject to the October number of the American Journal of Insanity, of which the following is the substance, says the New York Medical Journal.

The diurnal alternation of night and day is not without interest in its psychological influence upon the human race. The ebb and flow of energy that it represents is an element of vast importance in our existence. Day is the period of active energizing, night that of repose and recuperation. In the former there is a state of elevation, a natural confidence and a willingness to undertake whatever responsibility may present itself. In the latter there is just as truly a natural depression, a timidity and cowardice in confronting the obstacles in our path.

The accumulated inheritances of countless ages through this ever-recurring elevation and depression have stamped this wavelike characteristic upon every mental operation. The ebb and flow in mind activities is universal. It permeates every form of psychic energy. It gives coloring to our emotional states. It is seldom that in any individual, or at any time, we find an accurate ideal equipoise. We are either in a state of exaltation or of depression, either too confident and self-reliant, with vision too highly colored and enthusiasm too much exalted to be justified by the circumstances of our environment, or we are in the opposite condition of depression and timid cowardice, with little confidence in our powers and an undue extravagance in our estimate of the difficulties in our pathway. Even when this becomes impersonal and is crystallized into the energy of nations, the same tendency is seen. One extreme of opinion almost invariably follows another. The pendulum of thought and psychic energy forever swings first to one extreme of its movement, then to the other. The world is apparently unable to calmly and deliberately maintain a correct status in opinion or practice. It is either too credulous or too suspicious, too indulgent or too intolerant, too confident in its knowledge or too ready to find cause for criticism and disbelief. How far this oscillation between antipodal points depends upon or is influenced by the diurnal withdrawal and return of the solar influence, says Dr. Richardson, is possessed of more than merely curious interest. It is not unworthy of a few moments' time and study.

Night is the withdrawal of the light and heat of the sun. No amount and no intensity of artificial illumination will replace this withdrawal. In spite of all the artifice and invention of man, night still reigns supreme. No matter how much we may attempt it, we cannot turn night into day. Although we may supply light and noise and the stir and bustle of day, it is still night. The tendency toward repose and a letting down of the armored guard that the activity of day brings with it are still there.

There is an element of timidity and fear in our organization that is greatly enhanced at night, and this may largely account for our increased credulity at that time. Our belief is born of our fears. How many physicians are there, he asks, who cannot bring proof of this? Many of their night calls are due to the greater uneasiness of the patient or his parents or friends on the approach of night. They are affrighted then at symptoms that would not alarm them during the day, and hasten to send for the physician to relieve them of the fears that night itself has seemed to bring to them. Again, in many cases of illness there is an actual exacerbation in the symptoms with the approach of night. This is notably so in children. This may have a double origin. It may be due to the increased timidity of the individual at that time, and a consequent increase in the subjective sensations of the disease, and it may be due, at least in part, to the natural letting down of the power of resistance of the organism that we believe does occur during the night. Whatever may be the explanation, says Dr. Richardson, the fact is indisputable, and there is not a mother who does not dread the approach of night when her child is seized with a dangerous illness.

A still more interesting fact is the influence of the night season over moral attributes. There is a letting down in this direction which is very similar to that seen in the field of the emotions. The power of resistance to things evil is then diminished. The very mystery of night is conducive to an expanding of the imagination. There is a sharpening of all the senses that renders every sound clearer and makes every object stand out in greatly heightened distinctness. The sense of hearing is more acute, the eyesight detects objects more readily, the touch is quickened, and the whole being is more sensitive. Whether this is evidence of weakness, says the author, the hyperæsthesia of nervous exhaustion, or a quickening of every tissue in its instinctive strife for self-preservation, may be beyond us; of the fact we all have proof in the promptings of our own hearts.

The most dangerous hours of the twenty-four, he continues, to the melancholic are the latter hours of the night. The depression is then greatest, obstacles then seem most insurmountable, and the power of resistance to the suicidal impulse is then least effective. He has often found it necessary to give special instructions to attendants in this regard. This all goes to demonstrate, he says, that the energy of the patient is at its lowest ebb during the night; that there is then a natural depression and timidity.

What is experienced by the sane, influences also the insane, and obstacles and misfortunes then mount highest in their vision. There is doubtless scarcely a melancholic who does not at one time or another have suggestions of self-destruction, and whether or not they will control him depends entirely on the strength of the suggestion. The particular hour of the night is often sufficient to throw the balance against the poor unfortunate, and in this sense it becomes an actual exciting cause of suicide.

It is a fact that we should not lose sight of, and the author is convinced that it has its basis in a physiological variation of the organism at this hour. Just as certainly, says Dr. Richardson, as there is a physiological condition of exaltation and sense of well-being, so also is there a physiological state of depression and irritation with our environment. It is not necessary to assume that this implies disease. It does not. It is simply an inevitable reaction, such as is seen in all physiological phenomena. There is a coming and a going, a rise and fall, a season of joy and a sense of pain, and he is persuaded that the greatest factor that instituted and enforces this law of Nature is the daily cycle of the earth on its axis, with its necessary presentation and withdrawal of organic life to that source of all life and energy, the solar center. In its presence we imbibe warmth, energy, confidence, life; in its absence we suffer the reaction of coldness, lowered ambition, lack of confidence, and moral cowardice—a curious physiological fact and one not without its practical application.

AMONG the portraits recently acquired by the trustees of the National Portrait Gallery, London, is that of Sir Francis Ronalds (1788–1873), the inventor of the first working electric telegraph.

Science Notes.

An annual meeting of the American Microscopical Society will be held at Toledo, Ohio, on August 5–7, under the presidency of Prof. E. W. Claypole.

The specifications of the new wing of the American Museum of Natural History, New York City, have been approved by the Park Board, and bids for the building will soon be opened.

Harvard University has conferred the degree of A.M. on Prof. Franklin W. Hooper, of the Brooklyn Institute of Arts and Sciences. Prof. Hooper's great work in the city of Brooklyn is certainly worthy of some recognition.

The London Chronicle calls attention to the death rate in many of the model dwellings in that city. In particular there is found in the houses of the Metropolitan Association for Improving Dwellings of the Working Classes a death rate of only 9·64 to 1,000. The inmates of these houses number 6,430, and are housed in fourteen blocks in different parts of the city. This rate is only half the rate for the whole of London.

A note in Cosmos states that Kotz measured the amount of fatigue produced on the eye by different kinds of artificial light, by counting the number of winkings of the eyelids in ten minutes. For the candle he obtained 6·8 per minute; for ordinary gas, 2·08; for sunlight, 2·2; and for the electric light, 1·8. All lighting causing more than three per minute ought to be rejected. (It is not stated what the eye was looking at when the measurements were made; it certainly could not have been the source itself.)

The Albert medal for the present year has been awarded, with the approval of H. R. H. the Prince of Wales, President of the Society of Arts, to Mr. G. J. Symons, F.R.S., for the services he has rendered to the United Kingdom by affording the engineers engaged in the water supply and the sewage of towns a trustworthy basis for their work by establishing and carrying on, during nearly forty years, systematic observation (now at over three thousand stations) of the rainfall of the British Isles, and of recording and tabulating and graphically indicating the results of these observations in an annual volume published by himself.

Since the application of photography to stellar charting, the discovery of planetoids between Mars and Jupiter has gone on apace, upward of four hundred and forty of these bodies having been recognized as such. Of these, M. Charlois is to be credited with the discovery of no less than eighty-eight, five of them during the year 1896, during which nineteen additions altogether have been made to the already overgrown list. With telescopes of the enormous aperture now constructed, and with sufficiently prolonged exposure, there seems no particular reason why this number should not ultimately increase very materially.

Indians and animals typical of America are to be perpetuated in bronze for the National Zoological Garden at Washington, if the plans of certain men of public affairs at the national capital are carried out. And Edward Kemeys, the Chicago sculptor, is the artist who is to execute the statues of the fast disappearing red man and the fauna of America. Congress will be asked for an appropriation for the purpose, and it is expected that that body will respond as generously for the purpose as it has heretofore in the beautifying of the great national park. Capt. Kemeys has returned to his Bryn Mawr residence after a six weeks visit to Washington and is at work on the project.

An interesting discovery from a geological point of view, says Le Génie Civil, was recently made by an explorer in the mountains of Witzies Hoek, Natal. On the summit of an extinct volcano, on the edge of a lake that occupies the crater, soundings revealed a layer of sand inclosing small diamonds. It would be interesting to know whether these diamonds were there accidentally, that is, as the result of washing operations carried on by the natives, or whether this discovery corresponds to an actual mine of diamonds, for the hills of Witzies Hoek are not situated in regions known to be diamond bearing. On this last hypothesis, the presence of precious stones in the crater of a volcano would doubtless throw some light on the formation of the gems in nature.

M. H. Leman says, in a German technical paper discussing standards of length, that the straight line mark on a scale is in reality a trough with inclined sides, the surface of the trough being more or less rough and uneven. In order to define more minutely the distances on a scale, the author adopted the following arrangement: A fine platinum wire, 0·04 millimeter in diameter, had an electro deposit of copper until the outside diameter was 1 millimeter. Short pieces of this compound wire were driven into holes in the bronze body of the scale, and the whole surface carefully polished. In this way the white circular marks were clearly defined from the body of the scale, the centers of these circles could be very accurately determined by the two parallel wires of the microscope, the distance between the wires being slightly less than the diameter of the platinum wire.

THE X RAYS IN THE CUSTOM HOUSE.

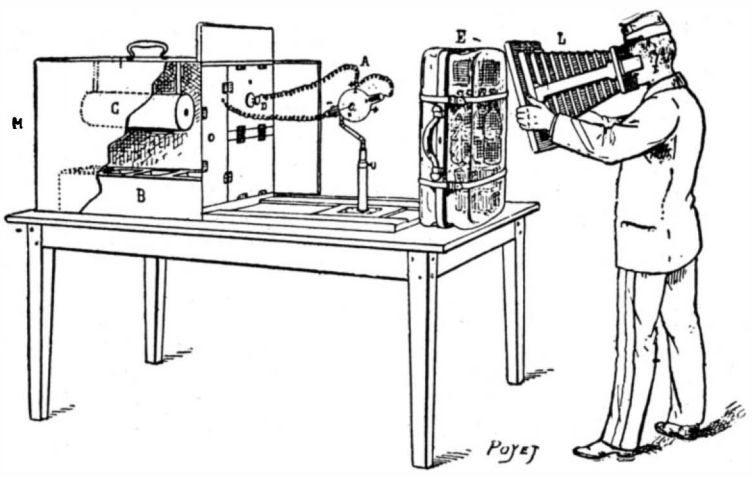
The X rays are winning fresh laurels nearly every day through some new application of their mysterious and irresistible power. The most recent of such applications is the utilization of these inquisitive and all-seeing radiations by the custom house. In the railway stations of Paris, the X rays have been employed for a week past for examining packages of all kinds and sizes, from small parcels and valises up to trunks and large bales, in order that their contents may be ascertained without having to open them. The experiments are not confined to baggage, for the travelers themselves are inspected, in order to have the X rays reveal any objects that may have been concealed under the clothing. Before long a radioscopic service is to be organized in one of our frontier cities, probably in Bellegarde.

Our readers will certainly not be very greatly surprised to hear about the experiments that are being made by M. Pallain, director of the custom house, a man of learning and progress, who has a thorough dislike for routine; nor will they be surprised either to learn the very satisfactory results given by such experiments. Nearly six months ago we described in these pages, in its minutest details, the method of investigation of which the custom house is now endeavoring to make a happy and supplementary application. The apparatus proposed for the instantaneous inventory of packages are the same as those used for experiments in radioscopy or fluoroscopy. Let us again briefly explain the principle of the method. Let us take a Crookes tube in which a vacuum up to a millionth of an atmosphere has been formed, and let us cause the current of an electric machine (preferably a Ruhmkorff coil) to circulate therein; and let us place before the tube a screen covered with a fluorescent substance, say (to confine ourselves to the most active materials) platinocyanide of barium or tungstate of calcium. The screen will be immediately illuminated, even when the Crookes tube has been covered with a thick envelope of black paper. This is the fundamental Roentgen experiment. As all the radiations known are incapable of traversing an envelope of blackened paper in order to go far enough to influence a fluorescent substance, it became necessary to suppose the existence of radiations formerly unknown, invisible to us, and capable of passing through obstacles impermeable to other radiations. These are the Roentgen or X rays.

Scientists have multiplied the observations and have found that, as with light, there are bodies transparent to the X rays, that there are others that absorb them more or less, and that there are others again that are opaque to them. But, while with light it has been impossible to connect these differences of transparency with another physical or chemical property of bodies, for X rays a sufficiently exact rule has been formulated, viz., substances are so much the more opaque to the X rays in proportion as they are more dense, and so much the more transparent in proportion as they are less dense. Thus wood, a porous body, opaque to light, is traversed by the X rays, while glass, a dense body, transparent to luminous radiations, arrests the X rays. If, then, between the Crookes tube and the fluorescent screen we interpose a thin piece of wood or even a box, the latter will arrest but a small number of X rays, the screen will remain illuminated, and the illumination of the part corresponding to the box will undergo scarcely any reduction. If, on the contrary, we interpose a metallic object, the latter, arresting the X rays, will project upon the screen a shadow of which the dimensions will depend upon the respective distances of the tube, object and screen, as well as upon the position of the object with respect to the tube and screen. If we place a coin in a wooden box and look at the latter, nothing will apprise us as to the presence of the money, because the wood is opaque to light; but if we arrange the whole between the Crookes tube and the screen, a shadow will immediately appear upon the latter and reveal to us the existence of a metallic object in the box. Finally, if we interpose an object of variable density between the tube and screen, the hand, for example, the fleshy parts of the latter will allow most of the X rays to pass and produce but a slight reduction of the illumination, while at the same time the bones, which are dense, will project a shadow that will detach itself sharply from the screen.

In order to succeed with these simple experiments in radioscopy or fluoroscopy, that is to say, in order to perceive the fluorescent screen, and, upon the latter, the shadow of the objects opaque to the X rays, it is essential to operate in darkness. In the full light of the day the feeble glow emitted by fluorescent substances would be extinguished. Nothing is easier, however, than to succeed with these experiments in broad daylight. It suffices to fix the screen to a tube of black paper and to look through the other extremity in order to immediately observe upon the screen the appearance of the shadow of invisible objects placed in front of the Crookes tube.

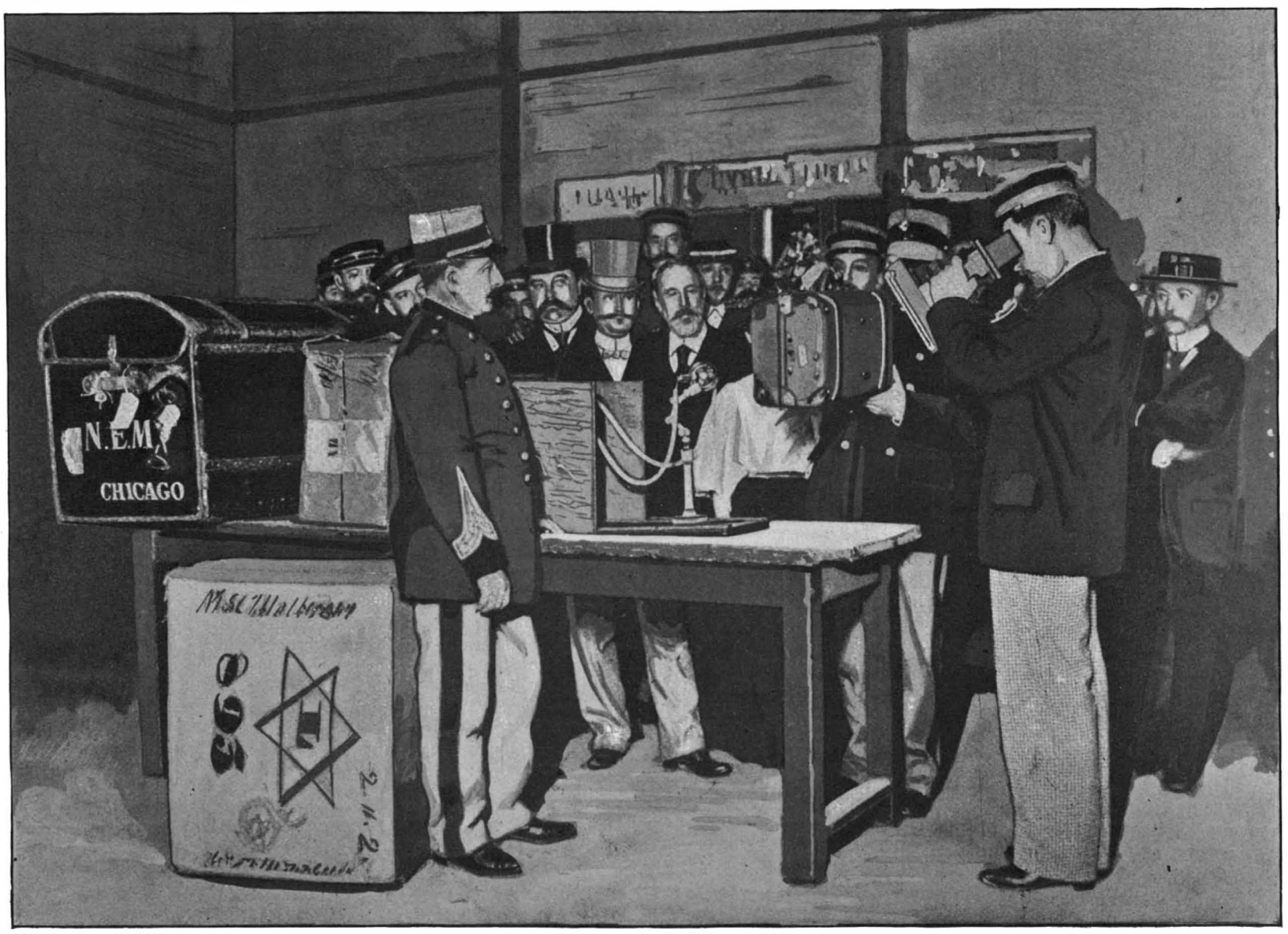
Such an arrangement is within the reach of everybody. It may be very easily realized by procuring half a dozen objects of everyday manufacture; a Ruhmkorff coil, which may be supplied by batteries or accumulators, a Crookes tube or one of those vacuum tubes designated as "focus tubes," a fluorescent screen and a cornet of black paper.



ARRANGEMENT OF THE INSPECTION APPARATUS.

M. Seguy, preparator at the School of Pharmacy of Paris, in inventing his "Human Lorgnette," has merely put this arrangement into a convenient and portable form. As his apparatus has been presented to the Academy of Medicine by Dr. Roux, and as the customs administration is using it in its present experiments, it appears to us of interest to give a description of it. The human lorgnette, as a whole, is contained in a box, M, of cubical form, measuring 24 by 24 by 24 inches and weighing 62 pounds. This box is provided with three compartments, one of which contains four light accumulators, B; another, a special high tension transformer, C; and the third the tube that produces the X rays, fixed upon a jointed support that permits of turning it in all directions and moving it along a slide. It is likewise in this third compartment that is placed the lorgnette, L, properly so called, the body of which consists of a bellows similar to that of a camera. One of the extremities of this is closed by the screen, the fluorescent surface of which, formed of a sheet of paper covered with platinocyanide of barium, is turned toward the interior. The other extremity is provided with a silk-lined mask that entirely covers the upper part of the observer's face and thus prevents the introduction of the surrounding light.

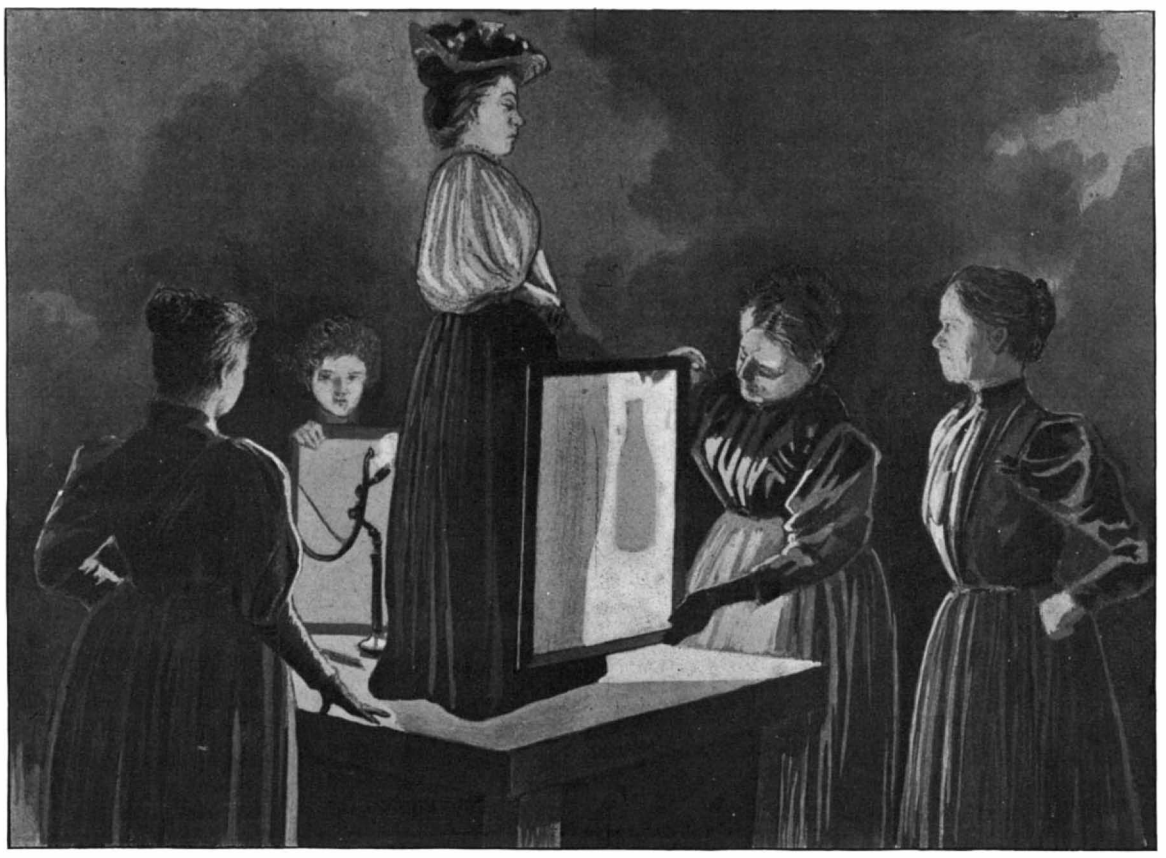
In order to proceed to the examination of a package, E, by radioscopy, the box is opened, the lorgnette is extended, the support of the vacuum tube is moved forward, and the button of the commutator, C, is then pushed. The current of the generator of electricity enters the tube, and cathodic rays are emitted by the cathode or negative pole arranged in the form of a concave mirror. These rays, striking the anode or positive pole, which is in the form of a plane mirror, give rise to the X rays. The package to be examined



RADIOSCOPIC EXAMINATION OF A VALISE AT THE CUSTOM HOUSE.

is placed as near the lorgnette as possible, that is to say, almost in contact with the screen, and at a distance of about eight inches from the tube. It suffices to look into the lorgnette in order to perceive at once the shadow of the densest objects contained in the package under observation. We therefore perceive only the densest objects, and, consequently, the use of radioscopy in customs examinations is limited. In fact, the aid afforded by the X rays to the officers whose business it is to inspect the entry of dutiable objects or materials at the frontier or at the gates of cities must not be exaggerated.

We reproduce a photograph of a scene that occurred recently in the large merchandise hall of the Saint Lazare station. We have seen a customs inspector examining a valise by means of the human lorgnette and in the presence of the members of the High Commission of Customs. It is certain that the inspector distinctly perceived in the interior of the valise the metallic objects that the latter contained. Amid the linen he plainly saw cigars and metallic boxes in which contraband objects could be concealed. But the fluoroscopic examination could not teach him any more. It would be impossible, for example, to distinguish by fluoroscopy such things as new fabrics and laces, which are dutiable, from those that have been worn and are admitted free.



A SMUGGLER DETECTED BY THE X RAYS.

M. Remond, who presented M. Seguy's apparatus, afterward proceeded to make a series of very interesting experiments. He brought in a carelessly wrapped package tied without any precaution, and which was apparently valueless. Having placed this before the fluorescent tube, there were at once observed upon the screen a number of loose cigars scattered through the bundle. He showed a deal box, which, when opened, appeared to contain nothing but straw and rags. This box had a false bottom, and upon the fluorescent screen there were instantly seen the objects that were concealed beneath the partition.

The most curious scene was undoubtedly the examination of a female smuggler, as such examinations will hereafter be conducted by the searchers skilled in radioscopy. We reproduce this scene from a photograph taken upon the spot. A woman whose appearance was such as to avert any suspicion was placed before the telltale apparatus, and there was immediately observed upon the screen a bottle in front of her legs. This appearance had not all the success that it merited, since it had been predicted to us by a customs officer, whose practiced eye, skillful in detecting fraud, is no less piercing than the X rays. M. Remond, complaisantly making the smuggler walk, asked the spectators if they remarked anything abnormal about her. The inexperienced answered, No; but a customs officer present was not to be deceived. "This woman," said he, "has something under her frock." He had observed some embarrassment in her walk, and had guessed the presence of the bottle.

It would be wrong, then, to imagine that the X rays are going to suppress customs inspectors and to substitute therefor what has been called, by an amusing neologism, "radioscopers." The indications furnished by the X rays will, in many cases, be inadequate, and will not allow travelers to escape an inspection of their trunks.

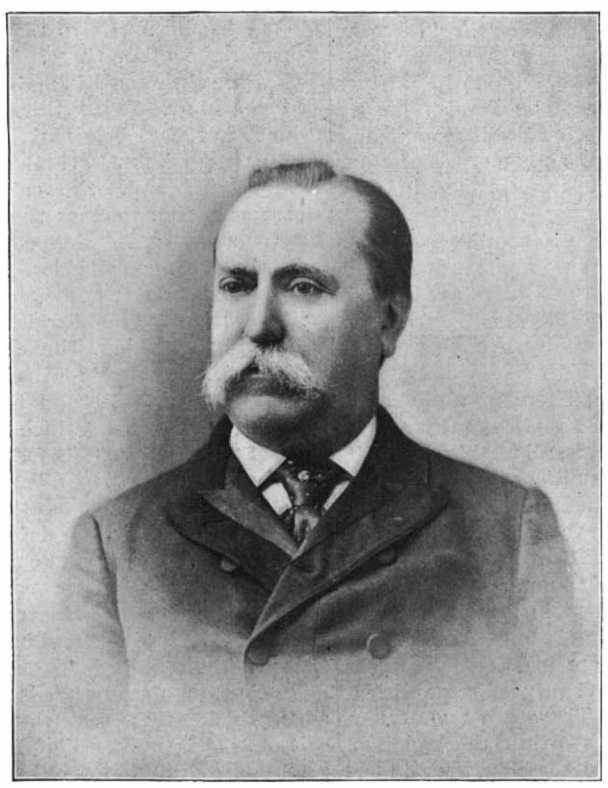
On the contrary, the rays discovered by Prof. Roentgen will be very usefully employed for the rapid examination of small parcels, postal packages, and valises. The officers of the custom house will have a method, either with the human lorgnette or with an analogous apparatus consisting simply of an electric source, a focus, tube and a fluorescent screen, of immediately ascertaining at a glance the relative accuracy of the declarations made by shippers or travelers. They will thus be able quickly to detect fraud; and, if they desire, to avoid submitting honest people to the useless annoyance of inquisitorial inspection. What is most unpleasant and vexatious in such inspections is the contact of the officers' hands with the linen and other objects contained in the baggage.

If the new process does away with the necessity of such contact, or simply permits of diminishing the frequency thereof, the director of the custom house will gain the thanks of the public by adopting it.—L'Illustration.

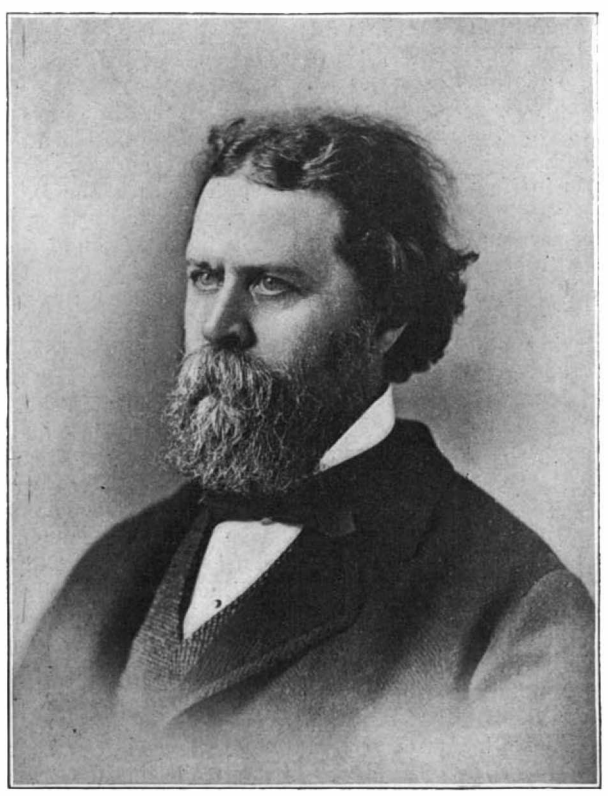
MEETING OF THE AMERICAN ASSOCIATION.

BY MARCUS BENJAMIN, PH.D.

It has often been noted as an interesting fact that the American Association has commonly three presidents in attendance at one of its meetings. These are the retiring president, who yields the chair to the incoming president at the opening of the session and delivers his address on the same evening, and the president elect, who is chosen at the meeting held on the last day. This year, by the death of Edward D. Cope, whose demise in the spring deprived this country of one of its most brilliant scientists, a fourth name presents itself in that of the senior vice president, who succeeded to the presidency, and who will call the meeting to order in the place of President Cope and deliver the retiring address, which on this occasion, at the request of the council, will take the form of a critical description of Cope's contributions to science. No one is more competent to attempt this task than Prof. Gill, for he has been the friend and fellow worker of Prof. Cope in similar lines since the early sixties, when the two young men were fellow students in natural history under Prof. Baird in the Smithsonian Institution. That the address will be a splendid summary of the work in natural history for the last quarter of a century is confidently expected by those who are already familiar with Gill's admirable biographies of Huxley and Goode that were prepared on the deaths of these two men.



PROF. THEODORE NICHOLAS GILL, PRESIDENT OF THE AMERICAN ASSOCIATION.



PROF. OLIVER WOLCOTT GIBBS, PRESIDENT ELECT OF THE AMERICAN ASSOCIATION.

PRESIDENTS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Theodore Nicholas Gill, who ranks among the very first of American zoologists, is a native of New York City, where he was born on March 21, 1837. His early education was received in private schools and from private tutors, and then he studied law, but never was admitted to the bar. As he grew to manhood he developed an interest in natural science, and during the winter of 1857–58 he visited Barbados, Trinidad and other West Indian islands for Mr. D. Jackson Stewart, for whom he collected shells and other specimens in natural history. The results of his explorations were worked up mainly in the library of Mr. J. Carson Brevoort, and published in the Annals of the New York Lyceum of Natural History and in the Proceedings of the Philadelphia Academy of Science. It was in the library (the best of its kind in the United States) of this patron of science that he laid the foundations for that great knowledge of books and authorities which, combined with a splendid memory, has stood him in such good stead in his latter years. In 1859 he visited Newfoundland and studied its fauna, and in 1860 prepared a report of the fishes of the northwest boundary for the State Department.

It was about this time that he came to Washington, which has since been his home, and in 1862 he became librarian of the Smithsonian Institution. This office he held until 1866, when the library was transferred to the Capitol, where he was continued in service until 1874, having become chief assistant. Subsequent to the last named date he has devoted his attention almost exclusively to studies in natural history, and is a daily worker in the Smithsonian Institution, having since 1894 held the honorary office of associate in zoology on the scientific staff of the National Museum.

Meanwhile he had become connected with the Columbian University, at first as associate professor of zoology and subsequently as full professor, which appointment he still holds, and gladly meets his classes

regularly, considering it a privilege to contribute his services without compensation to the university. It was from the medical department of Columbian University that in 1866 he received the degree of M.D.; that of Ph.D. came to him from Columbian University in 1870, and that of LL.D. in 1894, from the same source.

His activity as a zoologist has been unceasing, and his contributions to that science have included over five hundred separate papers, most of which have been on ichthyology. Of these, many appeared in the Proceedings of the Philadelphia Academy of Natural Sciences, but since 1878 the Proceedings of the United States National Museum has been his favorite place of publication. His work has been chiefly on systematic ichthyology, especially with the arrangement of fishes in their classes, orders, and families, yielding a more natural and restricted distribution of genera, which has been almost universally accepted in the United States, and recognized in Europe. Among the most important of his contributions are "The Arrangement of the Families of Mollusks" (1871), "The Arrangement of the Families of Mammals" (1873), "The Arrangement of the Families of Fishes" (1873); the zoological portion of "Johnson's Universal Cyclopedia," the greater part of the volume on fishes and a portion of the volume on mammals of the "Standard Natural History," and the zoological text of the "Century" and "Standard" dictionaries.

Prof. Gill is a member of over seventy-five scientific societies, including the National Academy of Sciences, to which he was elected in 1873. His connection with the American Association began in 1868, and in 1874 he was made a fellow. Last year he was chosen vice president of the section on zoology, and as the senior vice president succeeded to the presidency on the death of Prof. Cope.

Oliver Wolcott Gibbs, the president upon whom the duties of presiding over this year's meeting will devolve, is also a native of New York City, where he was born on February 21, 1822. His education was likewise received in his native city. After passing through Columbia Grammar School he was graduated at Columbia College in the year 1841. Turning his attention to chemistry he studied for a few months under Dr. Robert Hare in Philadelphia, and then took a course in the College of Physicians and Surgeons in New York City, after which he spent several years in Europe studying under such famous masters as Rammelsberg, Heinrich Rose, Liebig, and Regnault. In 1848 he returned to the United States, and for a year lectured on chemistry in Delaware College, Newark, Del., whence he was called to the chair of physics and chemistry in the College of the City of New York, where he remained until 1863, and then was elected to the Rumford professorship in Harvard University, with charge of the laboratory of the Lawrence Scientific School, which place he held for a quarter of a century, and then was made emeritus. Prof. Gibbs fitted up a private research laboratory in Newport, R. I., in 1887, where he had long had his summer home, and there he still continues his chemical studies. His personality attracted a large number of students to him at the Lawrence Scientific School, including such men as Frank W. Clarke, Charles E. Munroe, Samuel P. Sadtler, Thomas M. Chatard, and others of the foremost chemists of the United States. His research work has included elaborate memoirs on the platinum metals, on the ammonia-cobalt bases, on new analytical methods, and on complex inorganic acids. It is this last research, which has extended over many years, that led to his discovery of the platino-tungstates, the vanadio-tungstates, and the molybdates. He has also contributed valuable papers to the literature of physics.

During the civil war he was in New York City, and at that time became actively associated in the workings of the United States Sanitary Commission and was chosen a member of its executive committee. In this connection he frequently met the other members of that body, and out of their daily contact grew the idea that, for the successful carrying on of their work, their meetings should "take the form of a club which should be devoted to the social organization of sentiments of loyalty to the Union." This was the inception out of which quickly matured the Union League Club, of New York City, whose original meeting was held at his residence on January 30, 1863, and of which he is to-day the senior honorary member. Prof. Gibbs has been honored at home and abroad as no other American chemist has. He has received the degree of LL.D. from Columbia and from Harvard. He has been elected an honorary member of the Chemical Society of London, and is also the only American who has ever received an election to honorary membership in the German Chemical Society. He is one of the four surviving original members of the National Academy of Sciences, and in which he has held the office of foreign secretary, becoming in 1896 the president of that body. Prof. Gibbs has long been a member of the American Association for the Advancement of Science, and as far back as 1866 was a vice president of that organization.

At the meeting held last year, when it was proposed to hold a joint meeting with the British Association, the nominating committee, in casting about for the most distinguished American scientist to represent the American Association, were prompt to recognize the fact that the president of the National Academy of Sciences was indeed the most eminent living American scientist. The wisdom of this choice was universally conceded, and the American Association quickly ratified the action of their committee.

The Precious Metals.

The product of gold and silver in the several States and Territories of the United States for the calendar year 1896 is estimated by the Director of the Mint to have been as follows:

State or Territory.	Gold		Silver	
	Fine oz.	Value.	Fine oz.	Coining val.
Alabama	275	$5,700	....	....
Alaska	99,414	2,055,700	145,300	$187,863
Arizona	125,978	2,604,200	1,913,000	2,473,373
California	737,036	15,235,900	600,000	776,533
Colorado	721,320	14,911,000	22,573,000	29,185,293
Georgia	7,305	151,000	600	776
Idaho	104,263	2,155,300	5,149,900	6,658,457
Iowa	48	1,000	....	....
Maryland	15	300	..	....
Michigan	1,800	37,200	59,000	76,283
Minnesota	39	800	....	....
Montana	209,207	4,324,700	16,737,500	21,640,404
Nevada	119,404	2,468,300	1,048,700	1,355,895
New Mexico	23,017	475,800	687,800	889,277
North Carolina	2,143	44,300	500	646
Oregon	60,517	1,251,000	61,100	78,998
South Carolina	3,062	63,300	300	388
South Dakota	240,414	4,969,800	229,500	296,727
Tennessee	15	300	....	....
Texas	387	8,000	525,400	679,305
Utah	91,908	1,899,900	8,827,600	11,413,463
Vermont	48	1,000	....	....
Virginia	169	3,500	...	....
Washington	19,626	405,700	274,900	355,426
Wyoming	692	14,300	100	129
Total	2,568,132	$53,088,000	58,834,800	$76,069,236

The increase in the production of gold over 1895 was $6,478,000, while the production of silver shows an increase over that of 1895 of $4,018,000.

Foreign Papers Published.

There are 2,200 daily and 15,000 weekly papers published in the United States, and twenty-three different languages other than English are represented in the newspaper press of this country, says the New York Sun.

There is only one newspaper published in the Russian language in the United States. There are five newspapers, all weekly, in the Portuguese language. Of these three are in California and two are in Massachusetts, at New Bedford and at Boston. There are four daily newspapers in the Polish language, published at Chicago, Buffalo, Milwaukee, and Baltimore. Besides these there are seven weekly Polish papers at Chicago, six in Pennsylvania, one at Cleveland, one at Toledo, and three at Detroit. Most of the periodicals in the Spanish language are trade papers, but there is a daily paper in New York, and at Key West is another. There are four Spanish papers in Arizona and twelve in New Mexico.

One Armenian paper is published in the city of New York, and there are two Chinese weekly papers in San Francisco. Five newspapers are published in the Finnish language, two in the mine regions of Michigan and one each in Illinois, Minnesota, and New York. There are two daily Bohemian papers in New York, two at Chicago, and one at Cleveland. There are three Danish papers in Chicago, one in Omaha, one in Racine, Wis., and one in Portland, Ore. The Danish papers are, almost exclusively, designed for circulation among the farmers, and few of them have any city circulation, though there is one Danish paper published in New York.

The indisposition of the French to acquire any other language must account for the large number of French papers published throughout the Union, even where the French population is inconsiderable. There are French daily papers (read chiefly by French Canadians) at Fall River, Lowell, and New Bedford, and one published at Woonsocket, R. I. There are also French papers in New York and San Francisco and New Orleans. Eight other French papers, all weekly, are published in the smaller towns of Louisiana.

Seven newspapers are published in the Slavonic language, and of the four in Welsh three are in Utica and its neighborhood. Thirty Swedish newspapers are published, but no daily papers among the number; eleven Norwegian, seven of them in Minnesota; five Hungarian, one Greek, one Gaelic, one Arabic, and eighteen Dutch, nine of which are in Michigan, where the Hollanders are numerous, one only being published at the East, in Paterson, N. J. There are two Italian daily papers in New York and two in San Francisco, but outside of these two cities the Italian press in the United States amounts to very little. There are four papers published in the Lithuanian language, and twelve, three of them dailies, in the Jewish jargon. German newspapers are published in nearly every State, and German dailies in nearly every large city.

THE FOUNDATIONS OF THE EAST RIVER BRIDGE, NEW YORK.

Work upon the new East River suspension bridge, which is to connect New York and Brooklyn at a point about a mile and a half to the north of the present bridge is now well under way, and by the courtesy of the engineers we are enabled to present our readers with illustrations and particulars which show the progress that has been made at the present writing.

In our issue of September 12, 1896, will be found a bird's eye view showing the bridge as it will appear when finally completed and its relation to the surrounding districts. The terminus of the Brooklyn approach will lie on the block between South Fourth and South Fifth, Driggs and Roebling Streets, and the New York terminus will be located on the northern half of the block lying between Delancey and Broome, Clinton and Attorney Streets. The foundations of the bridge will be four in number, two under each tower, and they will rest upon timber and concrete caissons, sunk by the pneumatic process, upon which piers of solid masonry will rise to a height of 23 feet above high water. Above these will be built up the massive plate steel towers, each consisting of four corner posts, or legs, strongly tied together, the two groups of four on each pier being also connected by massive transverse lattice trusses and intermediate ties and struts. The top of the towers will be 335 feet above the river. The center span, 1,600 feet in length, will be carried upon four 18 inch steel wire cables, and the latter will be carried inshore 590 feet, where they will be anchored to massive masonry anchorages, each of which will be 150 feet square and 100 feet high. The shore spans will consist of independent trusses carried by the main towers, the anchorages and a pier intermediate between the former. The bridge will be stiffened against deformation under moving loads by a pair of continuous lattice trusses 40 feet deep. Between the trusses will be six elevated railroad and trolley tracks, and on the outside of each truss will be a roadway for vehicle traffic. Two walks for pedestrians will also be provided. These will be placed inside the trusses and above the trolley tracks. The total width of the floor will be 118 feet. There will be no terminal stations to this structure, as there are to the Brooklyn Bridge, the aim of the city authorities being to provide a broad, continuous thoroughfare, over which trains, vehicles, and pedestrians may pass without any interruption.

It can be well understood that in building a structure of these vast dimensions, whose term of life should be reckoned by the thousand years, the most important consideration is the foundations, inasmuch as upon these the stability of the whole structure depends, and when they have once been put in, they are forever beyond the reach of alteration or repair. It is conceivable that faulty design or poor material in the superstructure might be remedied, even after the bridge was completed—so great is the skill and resourcefulness of the modern engineer; but blunders in the design or construction of the piers of a 1,600 foot suspension bridge would probably wreck it beyond all hope of recovery.

The foundations of the new bridge will consist of timber caissons filled in with concrete. Owing to the varying depth of the rock below the surface of the river, no two of the caissons will be of the same dimensions, although they will all be similar in construction. The structure which is shown in the accompanying illustrations is the north caisson of the New York tower, and the description of the plant and methods employed in sinking it to place will apply also to the work on the other three. The borings show that the bed of the river consists mainly of sand, with some clay and bowlders. Below this, at a depth which varies from 45 to 71 feet below high water, is a very irregular surface of gneiss rock, similar to that which is found on Manhattan Island. The caisson will be sunk through the sand until it touches the rock, which will then be blasted away and "stepped" until the edge has come to a fair bearing on all sides. When this has been done, the space between the rock and the roof of the caisson will be carefully filled in with concrete.

Roughly speaking, the caisson, with its attached coffer dam, may be described as a huge boxlike structure, 60 feet by 76 feet on the sides and 19 feet deep, fitted with a bottom, which is placed, not at the lower edge of the sides, but 7½ feet above it. The space below the bottom or "roof," as it is called, constitutes a working chamber in which the blasting and excavation of the river bottom is carried out. Its walls are two feet nine inches thick and consist of two courses of 12× 12 inch timbers, the outer course being horizontal and the inner vertical, on the outside of which are two layers of 3 inch plank and one layer of the same thickness is laid on the inside.

The bottom of the walls is furnished with a cutting edge, which extends continuously around the whole caisson. It is built up of ½ inch steel plates, and it extends two feet below the bottom of the lower timbers, being stiffened at every two and a half feet of its length by knee braces. The lower twelve inches of the edge is also stiffened with reinforcing plates, which brings its total thickness up to two inches. It should be mentioned that the cutting edge is not intended for

literally cutting through the river bottom, as its name would imply, but it is put in to enable the workmen to use their tools close up to the outside of the caisson, and, indeed, just a few inches beyond it. The wall proper is nearly a yard thick, and if a bowlder were lodged beneath it—supposing the cutting edge were not in use—it would be a more difficult operation to get at it than it is when the wall is only, as in this case, two inches in thickness. The shoulder, moreover, gives room to shore up if it should be necessary.

The roof of the working chamber is five feet in thickness, and consists of the following material: First, there are two courses of three inch plank, laid in opposite directions; then a layer of 12 × 12 timbers, followed by a layer of 12 × 14 timbers, laid crosswise; above this are two courses of three inch plank laid diagonally, and above these are two more layers of 12 × 12 timbers. All the joints in this working chamber and in the side walls are carefully calked and white-leaded, so as to make it perfectly airtight. The roof, and indeed the whole caisson, is stiffened with a series of massive plate steel riveted trusses, eight in all, which extend entirely across it from wall to wall. They are placed immediately above and transversely to the first course of 12 × 12 inch timbers, the successive upper layers being framed in carefully between the struts and ties of the trusses. The timbers of the whole caisson, both walls and roof, are securely drift-bolted together, and every care is taken to make this structure both rigid and waterproof. The details of this construction are clearly seen in the sectional view, showing the sinking of the caisson, and in the views taken during its construction. The working chamber is also strengthened with two solid bulkheads two feet four inches thick, which extend entirely across it, dividing it into three compartments, openings being left to allow the workmen to pass through. At the level of the bottom of the walls is a massive framework or gridiron of 16 × 16 inch timbers, which is bolted together and to the side walls with one and one-half inch tie rods. At each intersection vertical posts reach from this frame to the roof, and the whole system is tied together and stiffened against lateral distortion by diagonal struts and tie rods, as shown in the sectional view. The object of this mass of bracing and truss work is not merely to enable the roof to carry the superincumbent load of the masonry, but to enable the whole caisson to endure without distortion the heavy transverse strains to which it is subject when it gets "hung" upon any projecting point of the uneven rock bottom.

The steel trusses, which are 9 feet 3 inches deep and weigh 10 tons each, are a novel feature in this class of work. They were rendered necessary by the shallowness of the caisson, which was in turn due to the unusually short distance to solid rock.

The roof is pierced with seven shafts, each about 3 feet diameter, for the passage of men and materials, and also with a number of pipes, from 1 inch to 5 inches diameter, for supplying air and water, blowing out sand, and for carrying the electric light wires. The shafts are circular in section and are put on in lengths of 8 feet, as the masonry is built up.

The caisson was built up as described to its full height of 19 feet, on launching ways, and previous to the launch a cofferdam or temporary wall, 10 feet in height, was added above the structure, and bolted to it with angle plates and tie rods. The object of this is to keep the water away from the masonry while the caisson is being sunk to the bed of the river. When the caisson rests on the sand and the masonry pier is well above high water, the cofferdam will be unbolted and floated away. After that, as the caisson is sunk, masonry will be added, so that the top will be always kept above high water.

In the cut showing the caisson being towed to the site, the wall of the cofferdam can be clearly distinguished from that of the caisson.

Preparatory to launching the caisson, the river bottom at the site was dredged out to a depth of 25 feet, and a fairly level bed was prepared on which it might rest. The caisson was then launched and towed to the site and sunk by filling the crib above the roof with concrete. The latter is carefully rammed in between the steel trusses and the crib timbers, and finished off flush with the top wall of the caisson. The weight of this concrete and a few courses of the masonry pier proved sufficient to sink the caisson to the bed of the river.

The next operation is to clear the working chamber of water, and this is done by the simple expedient of forcing air into it until the river bottom has been laid bare. The workmen, who are known by the expressive name of "sand hogs," are then sent down the center shaft and begin the work of excavation. The sand is blown out through four inch pipes by means of air pressure, the column of sand and water in the pipe being rendered buoyant by admitting compressed air through a small pet cock near the roof. A water jet is used to loosen the sand at the mouth of the blow pipe, and it is carried out in a swift and steady stream. When harder material, such as clay or bowlders, is met, it is taken out in buckets through hoists reserved for that purpose. The top of each shaft is provided with an air lock, which is simply a closed chamber with an airtight door at top and bottom. The upper door is opened, the workman enters the chamber, and the door, which opens inward, is closed after him. Air is then admitted to the chamber until the pressure rises to that in the shaft, when the lower door, being relieved of pressure, can be opened. The man then descends by the ladder into the working chamber. The operation of the material locks is the same, the wire rope passing through a stuffing box in the outer doors.

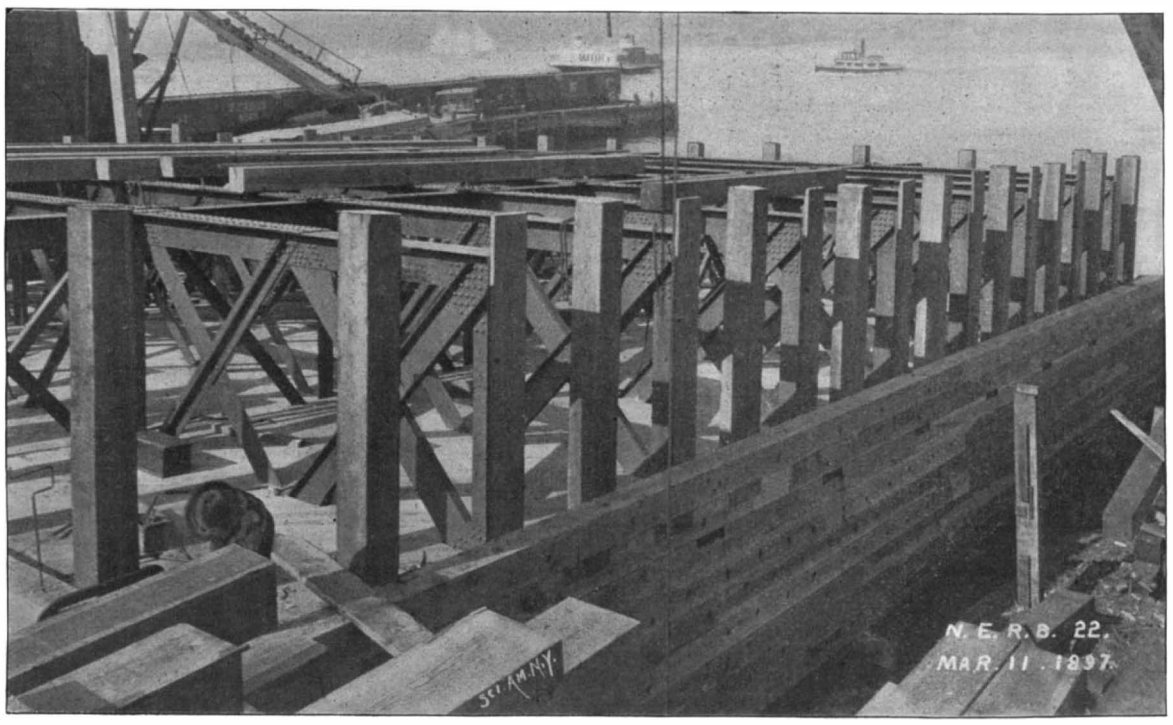
As the material is excavated the caisson will sink from its own weight, and the process is carried on until it has been carried down to a solid rock foundation. The next step will be to fill up the void represented by the working chamber. For this purpose concrete will be sent down the shafts and tamped in place, the filling-in commencing at the walls and being carried on toward the center. The last of the work will be done by a single man, who will place the last shovelfuls at the base of the shaft. All the shafts will then be filled with concrete, and after this is done the masonry piers will be carried up to their full height and capped ready to receive the steel towers.

It is expected that a suitable rock bottom will be found at a depth of about fifty-six feet below high water.

The plant concerned in these operations is quite extensive, as will be seen from our front page engraving. By a piece of good fortune a substantial river pier is standing exactly on the axis of the bridge, and, therefore, between the two piers, which will be 97 feet 6 inches center to center. Upon this has been erected an engine and boiler house, which contains three large boilers, two Ingersoll air compressors, a Knowles water pump and an electric light plant. In front of this is located the concrete mixer and the derricks for handling the excavated material and passing in the concrete. Work is also carried on from scows on the end and side of the caisson, the stone for the piers being brought, already cut to the required size, on scows from a point up the Hudson River and lifted directly into place on the piers.

The estimated time of sinking the caisson to place is three months, and it is expected that the whole bridge, which is to cost about $7,500,000, will be completed in about five years.

We are indebted for our particulars to the courtesy of Mr. L. L. Buck, the chief engineer of the undertaking, and Mr. E. G. Freeman, the resident engineer on the New York end of the bridge.



CONSTRUCTION OF CAISSON, SHOWING STEEL TRUSSES ABOVE THE ROOF.

INTERIOR OF WORKING CHAMBER BEFORE ROOF IS BUILT ON.

How to Find Out if a Room is Damp.

To ascertain whether or not a room is damp, a kilogramme of fresh lime should be placed therein, after hermetically closing doors and windows. In twenty-four hours it should be weighed, and if the kilogramme has absorbed more than ten grammes of water (that is, more than one per cent), the room should be considered damp and classed as unhealthy. The question of the dampness of dwellings is a frequent cause of dispute between landlord and tenant, and is naturally solved in the negative by the former. The question can be settled in the future by the test of the hydration of lime, which will give irrefutable proof of the validity of such complaint.—New York Dietetic and Hygienic Gazette.

ACCORDING to Nature, the firing at Portsmouth, on June 26, was distinctly heard at Hungerford, Wiltshire, a distance of forty-five miles as a crow flies, and also at Great Malvern.

RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM BOILER.—William C. Stuckel, Chicago, Ill. To facilitate the distribution of the heat of the burning fuel to all parts of the water, and thus promote the quick generation of steam, this inventor has designed a boiler in which rods of copper, brass, or other metal traverse the water space and project into the fire box at one end and into a hood or smoke box at the other end, it being the idea of the invention that these rods, with portions exposed where the greatest heat of combustion is being evolved, will take up and distribute the heat through the water most effectively.

FURNACE DOOR.—Russell B. Hobson, New York City. According to this invention the door is so arranged with relation to the furnace that in the event of an exploded tube or pipe the pressure of the escaping contents of the boiler will act to effectually close the door, preventing the blowing of steam or water, or the contents of the fire box or ash pit, into the fire room, but necessitating their passage into the smoke flue or stack. It is an inwardly swinging door, with a casing or frame which overlaps the edges of the door at the outside, thus practically forming a valve and valve seat. The door is swung open by pushing it inward, when an adjustably mounted weight holds it open as long as desired.

SMELTING FURNACE.—John D. McDonald, Sudbury, Canada. This is a furnace designed to facilitate the smelting of pyrites, blend, sulphurets or sulphides, etc., without the continued use of coal, the apparatus providing a steady feed of the ore, the feed being controlled by lateral vibration, and the temperature at which the ore is delivered into the crucible, in treating fusible ores, being governed by the feeding devices. A feeding carriage has its frame formed with hollow base and upright side sections forming water jackets, and a deflector prevents the ore from clogging in the mouth of the crucible, and prevents the fine particles of ore from being subjected to the direct action of the blast upward from the crucible.

Railway Appliances.

SWITCH.—Charles Troup, Watseka, Ill. According to this invention the main rails and switch rails may be of ordinary construction, and a train or car may be shifted directly from the siding to the main line without operating the switch stand. In connection with the devices for operating the switch points a lock is provided, and means for releasing the lock, to be operated by the switch stand or other hand devices, there being also devices for automatically releasing the lock by the passage of trains from the siding to the main line. When the lock is released from the switch point the target is shown and remains exposed until the lock is again in engagement with the point.

CAR AXLE LUBRICATOR.—James S. Patten, Baltimore, Md. When the oil box is filled to the maximum depth with oil, according to this invention, the oil is in contact with the axle journal, and to insure contact when the oil surface is lower, an inclined trough is arranged lengthwise, causing the oil to reach the journal when the car lurches or makes a sidewise movement, there being also a spring plate, with inwardly curved side wings, lined with leather or other flexible material, which embraces the sides of the journal, to aid in effecting perfect lubrication. The spring plate conductor also forms a wiper to prevent the oil from running along the journal beyond the bearing, while baffle plates of flexible material prevent the escape of oil between the sides of the conductor and oil box.

Electrical.

FIRE HYDRANT VALVE.—Frank McDonald, Portland, Me. According to this invention an electrically operated valve is arranged in a casing to be situated near a fire hydrant, and through which run supply and discharge pipes, the valve and its operative mechanism to be connected with a conductor on a reel to be carried by a hose carriage, or as otherwise desired, and provided with a switch, whereby the man holding and directing the nozzle will be able to control the flow of water, avoiding the necessity of shouting orders, and preventing the flooding of a building after a fire is extinguished. When used in connection with a pumping engine an indicator advises the engineer as to the position of the valve, that he may govern the pumping power accordingly.

TROLLEY SWITCH MECHANISM.—Walram S. Browne, Brooklyn, N. Y. This invention is an improvement on a formerly patented invention of the same inventor, and provides for making only a single movement of the switch, for whichever way the car is traveling, instead of a double movement, as heretofore. It is an automatic switch in which the current switch consists of a short section of the trolley wire, split vertically into two parts insulated from each other, one of the parts being connected with the trolley wire circuit and the other with the circuit operating the switch moving mechanism, and adapted to be connected by the passage of the trolley, to supply the current for throwing the switch.

Bicycles, Etc.

BICYCLE HANDLE ATTACHMENT.—James Godfrey, Pittsburg, Pa. A third or supplemental handle, to facilitate steering a wheel with one hand, is provided by this invention, a vertically adjustable steering handle being pivotally attached by a clevis to the center of the handle bar. Two slotted and segmentally curved pieces are rigidly attached to the clevis and the central handle bar, the pieces being adapted to slide on each other, and to be clamped in any desired adjustment, to fix the central steering handle at a convenient height.

MAKING CYCLE GEAR CASES.—Horace W. Dover, Northampton, England. In moulding gear cases of xylonite this invention provides a preparatory tool for bringing the sheet roughly to shape to be completed by a finishing tool, for which a further patent has been applied for. It comprises a die plate with rib-surrounded orifice, a pressure plate adapted to engage the rib of the die plate, and means movable through the orifice in the die plate for drawing a plastic sheet between the pressure and die plates and moulding the sheet. Care is taken to avoid tearing the material by excessive pressure of the plunger, while maintaining sufficient pressure to prevent wrinkles in the moulded article.

Mechanical.

COMBINATION TOOL.—Beniamino Ibelli, New York City. A foldable measuring rule, with knife blades and a spring balance scale, is so made, according to this invention, as to unite these triple functions in a tool which is very compact in form, and may be carried in the vest pocket. The rule is in two hinged sections, there being in one section a recess for the knife blades and in the other a recess for a scale bar connected at its inner end with a contractile spring, the bar being graduated, and the scale being adapted to weigh small articles to be suspended from a hook projecting from the outer end of the bar.

Agricultural.

PLANTER.—Joseph A Pritchard, South Mills, N. C. A planter in which cotton seed may be placed just as they leave the gin, and without being olied, and which is also adapted for planting any kind of seed, has been devised by this inventor. The hopper is so made that it may be readily applied to the frame of a machine for planting corn or similar seed, and means are provided for keeping the driving wheel clean, and whereby the boot or furrow opener may be made to travel at any desired depth in the ground. In front of the boot is a wheel cutter, to separate clods of earth, tough grass, etc., and prevent trash from gathering around the boot.

Miscellaneous.

PASTEURIZING MILK.—Horace Atwood, Arden, N. Y. The apparatus designed by this inventor is adapted for the treatment of either milk or cream, or both combined, and comprises a central receptable surrounded by a jacket for steam and hot water heating, and arranged to be rotated by a belt, the contents of the receptacle to be subjected to the desired degree of heat for the length of time required, and then made to pass off through separate channels for the milk and cream from the effect of the centrifugal force. The milk and cream are thus heated to a temperature below the boiling point to render innocuous any germs the liquid may contain.

SEWING MACHINE NEEDLE GUARD.—Warren B. Davis, Brooklyn, N. Y. This device is formed of a single piece of flat material bent upon itself to form an eye, a twin shank and an arm at the end of each member of the shank, the arms being bent outwardly and then inwardly toward each other to form a clamp for engaging the presser foot shank. The device is simple and inexpensive, being applicable by a child, and is designed to prevent the operator from pricking the fingers or hand while adjusting the work under the presser foot, or during other manipulations while the machine is at rest.

SEWING MACHINE PRESSER FOOT DEVICE.—William A. Scott, Newcastle, Col. This is a device to be attached to the presser foot for folding in the edge of the material previous to stitching, and also applicable for a number of purposes, being adapted for all widths of hemming and all sizes of tucking, as well as to facilitate stitching bias or straight strips to the surface of the material. The attachment comprises a conical tube, holding clips on its lower side and an arm movable in the clips and having transversely extended fingers at one end, the end being turned upward and curved rearward.

PUMPING JACK FOR WELLS.—Fred J. Moser, Kane, Pa. This improvement comprises pairs of toggle links to whose upper sections are pivoted a clamp or collar adapted for connection to a sucker-operating rod, there being a fixed device to which the lower sections are pivoted, a collar adapted for connection to a pump tube, and a rock lever fulcrumed on the collar. Links connect the opposite ends of the rock lever to the lower sections of the toggle links, and an angle lever pivoted to the rock lever is adapted to engage near its angle with the fulcrum point of the rock lever. The device is designed to combine lightness with a maximum of strength, requiring no framework to rest it on or assist in its operation, and may be easily and quickly attached to or disconnected from a pump.

WIRE STRETCHER AND STAPLE PULLER.—Jesse R. McElroy, Southmayd, Texas. A tool which may be used with any form of fence post is provided by this invention, the tool enabling successive grips to be obtained on the wire, thus facilitating stretching and holding it under tension, while it may also be used for drawing staples and splicing between posts. The tool has a curved jaw with a body and two members terminating in claws, a handle connected with the curved jaw having a lengthwise slot in which a second handle slides, the second handle having a single-membered jaw terminating in a slot.

SWING JOINT FOR GAS FIXTURES.—Henry P. Drew, New York City. This invention relates to joints in which two cupped sections each have a socket extended from the periphery, the sections being pivotally connected. The invention provides for making a reliable joint rapidly and at a moderate cost of manufacturing, affording a perfectly smooth working, tight joint at all points of swinging movement, and obviating difficulties heretofore experienced from which the joints were liable to be tight at one point of their swinging movement and loose at another.

SPRING SEAT.—Jules Compin, Montargis, France. For all kinds of seats, chairs, benches, etc., this invention provides an improved construction, according to which the leaf spring of each seat is preferably fixed by one of its extremities to the frame of the bench or seat, while the other suitably bent movable extremity of the spring is arranged to engage a sleeve or eyelet on a stud or rod around which is a spiral spring. The latter is compressed by pressure upon the leaf spring, giving a variable elasticity to the seat, the leaf spring being returned to its original position as soon as the pressure ceases.

BRACKET.—Albert Taubert, New York City. A lazy tongs adapted for horizontal extension is, according to this invention, connected by a fixed sleeve at its inner end with a vertically supported rod, an outer section of the lazy tongs being connected with a manipulating rod having connection with a movable sleeve lower down on the rod, the latter sleeve moving down and up as the manipulating rod is folded, with the lazy tongs, close to the vertical rod, or held in extended position. The bracket may be arranged to swing at any desired angle to its support.

ADJUSTABLE INDEX TAGS.—Charles C. Smith, Exeter, Neb. This invention is for a metal clip having spring jaws, and a flexible tab secured to the clip and forming a cover for it, a projecting portion of the tab forming a tag on which may be printed any desired index guides, according to the use to be made of it in ledgers, account books, correspondence records, etc. The device is small, easily moved from one portion of a book to another, and is adapted to be to a ledger what a thumb index is to a dictionary. The inventor has already, we are informed, had great success in the manufacture and sale of these tags for use by banks, financial institutions and large manufacturing concerns.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

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(7183) G. E. B. asks: How should the lines be drawn on a paper so that, when folded for making a camera bellows, the same will be 6 x 5 at larger end and 3 x 3½ in. at smaller end, and so that, when compressed together, the folds will sink into each other; and, should the elevations of the folds connect alternately with the depressions, or should the elevations be continuous all around? A. Complete directions for making a bellows, with numerous illustrations, are given in SCIENTIFIC AMERICAN SUPPLEMENT No. 625. Price 10 cents by mail.

(7184) H. B. B. asks: Can you tell me why light colored clothes are supposed to be cooler than dark ones? A. Because they reflect heat as well as light.

NEW BOOKS, ETC.

THE SELF-PROVING ACCOUNTING SYSTEM. By A. O. Kittredge and J. F. Brown. Toronto and New York: Self-Proving Account Book Company. Pp. 328. Price $5.

One of the authors of this book has been for years a professional accountant and writer upon business credits, etc., and the other is a merchant, the book itself paying particular attention to the installment business. It gives illustrations of various books and forms in facsimile and is designed to be a complete manual for business men, accountants, and auditors. It treats first of accounting and second of bookkeeping, the accounts being classified according to kinds and the classes so arranged as to make a private ledger containing the condensed facts, a perpetual balance sheet as to resources and liabilities and profits and losses. The business man may thus at all times have a knowledge of his exact financial condition and the rate of his profits and losses.

PRACTICAL PLATING AND POLISHING. With a special article on nickel plating and polishing bicycle work. Giving the best and most approved methods of preparing and cleaning all metals for electroplating and polishing. Illustrated. New York: Zucker, Levett & Loeb Company. Pp. 114. Price 80 cents.

This is a welcome addition to the elementary works upon electro plating which are already so numerous. The book appears to be very practical, the formulas having been tested. The subject of nickel plating, bronze plating, brass plating, silver plating, gold and tin plating are treated. Considering the size of the work, it is remarkable to see how much useful information is compressed into so small a space.

HEAVEN AND ITS WONDERS AND HELL. From things heard and seen by Emanuel Swedenborg. Philadelphia: J. B. Lippincott Company. 1897. Pp. 453. Price 60 cents.

This work was originally published in Latin at London, A. D. 1758, and will prove interesting to those who are adherents to the Swedenborgian faith. The low price of the book places this important work in the reach of even those who wish to investigate his writings from curiosity. It is accompanied by an excellent index.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

JULY 27, 1897,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising device, W. G. Hingher 587,122
Amusement, apparatus, W. Wharton, Jr. 586,983
Animal trap, J. W. Anderson 587,255
Annunciator, switchboard, N. H. Holland 587,204
Arbor and attachment for holding articles to be polished and finished, C. H. Bartlett 587,170
Automatic switch, A. E. Burland 587,277
Axle lubricator, car, J. Donovan 587,188
Ball coupling for railway wagons, automatic, H. F. Oberlauter 587,061
Bar actuating device, W. R. Roney et al 586,976
Bearing for car journals, roller, W. J. Tripp 587,248
Bearing, side, E. S. Marshall 587,132
Bed lounge, L. G. Beloud 586,959
Bell, bicycle, H. S. Pullman 587,137
Bell, electric, J. T. O'Brien 587,062
Belt fastener, D. Von Vital 587,025
Belt shifter, F. Lombard 587,041
Belt tightener, Howard & Frazier 587,205
Berth register, sleeping car, S. C. Skanks 587,165
Bicycle, Cote & Vuillier 587,116
Bicycle, W. F. Stoll 587,069
Bicycle brake, F. J. Coombs 587,185
Bicycle brake, T. S. Miller 587,104
Bicycle cyclometer attachment, F. Mackintosh 587,010
Bicycle propelled boat, B. H. Brazelton 587,074
Bicycle rack, F. X. Hein 587,147
Bicycle saddle, J. C. Grout 586,997
Bicycle spring wheel, W. G. Gibbs 587,196
Bicycle support, D. Rudomin 587,236
Bicycle support and rest, Hussong & Robson 587,039
Billiard cue, Ghezzi & Bertoncini 587,195
Billiard cue tip sharpener, C. H. Paine 587,016
Binder, temporary, J. S. McDonald, Jr 587,044
Boiler furnace, steam, F. B. Giesler 587,121
Book, J. Dehn 587,076
Book, record, G. S. White 587,167
Boots or shoes, work support for, L. A. Casgrain 587,144
Boring apparatus for deep borings with oscillating beams, A. Raky 587,065
Bottle, Rodgers & Peden 587,234
Bottle and stopper for aerated drinks, C. Kemper 586,971
Bottle cap and fastener, A. L. Bernardin 587,275
Bottle, non-refillable, C. M. Johnson 587,003
Bottle stopper, J. H. Stone 586,980
Bottle stopper, G. Vodicka 586,981
Box. See Match box.
Box filling apparatus, W. B. Thomson 587,083
Brace. See Ratchet brace.
Bracket. See Shelf bracket.
Brake. See Bicycle brake. Wagon brake.
Brake beam, J. Timms 587,071
Brush, H. C. Topp 587,048
Brush holder, N. M. Beede 586,957
Bucket top, J. P. Zeiher 587,140
Buffing machine pad, E. F. Hodgkins 587,038
Bushing and faucet for barrels, M. S. Norton 587,157
Cabinet, J. F. Barrows 587,169
Caissons in the ground, means for sinking, J. McAdams 587,126
Cans, means for removing superfluous solder from sheet metal, O. S. Fellows ..... 586,964 to 586,967
Car coupling, C. G. Lind 587,218
Car coupling, J. W. Paisley 587,229
Car coupling, J. Timms 587,070
Car, dumping, J. A. Hughes 587,207
Car fender, G. W. Donning 587,187
Car fender, street, W. S. Bowen 587,178
Car replacer, D. Q. Walker 586,982
Car step, A. Blum 587,073
Car step, L. G. Heyward 587,095
Car unloading apparatus, L. D. Howard 587,206
Car wheels, apparatus for manufacturing, G. Althausse 587,141
Car window, J. Adams 587,030
Carbids, process of and apparatus for manufacturing metallic, I. L. Roberts 587,138
Carding engine, Meats & Eaton 587,267
Cart, dumping, C. Haeske 587,200
Cartridges, automatic machine for burnishing tubes for paper shell, W. Mason 587,133
Cash register, A. Macauley 587,042
Casting, truck end, E. S. Marshall 587,266
Centrifugal separator, E. W. Beach 587,171
Chain, sprocket, Barker & Cruser 586,956
Chair bellows attachment, rocking, Lilly & Kinney 587,008
Checkrein loop, J. T. Fogg 587,282
Chopper. See Cotton or corn stalk chopper.
Cigarette mouthpieces, machine for manufacturing, J. S. Beeman 587,172
Circuit closer, S. C. Houghton 587,260
Clamp. See Trousers clamp.
Clamp, G. M. Dougall 587,034
Clock, W. E. Porter 587,136
Clock and lamp, combination alarm, A. Pherson 587,064
Clock, electric programme, Bobsien & Prager 587,143
Cloisonne work for windows, etc., A. Navarein 587,225
Cloth folding machine, Riley & O'Connor 587,017
Clutch mechanism, C. W. Hunt 587,208
Coat holder, R. J. Stuart 587,246
Cock, water gage, J. C. Jensen 587,262
Coffee roaster, D. B. Fraser 587,090
Coin holder, W. Robinson 587,018
Composition of matter and article treated therewith, A. L. Kennedy 587,097
Condenser, electric, C. S. Bradley 587,114
Conduit, A. S. Krotz et al 587,213
Corn shock loader, L. & J. W. Shanks 587,082
Cotton or corn stalk chopper, D. G. Irby 587,209
Cotton picking machine, P. P. Haring 587,201
Coupling. See Ball coupling. Car coupling. Hose coupling.
Cradle, child's, G. F. Packard 587,014
Culinary vessel, A. Leavitt 587,152
Cultivator, G. L. Robey 587,066, 587,067
Cupboard and sink, combined, M. M. Belknap 587,115
Curling irons to be attached to gas burners, device for holding, W. E. Fuller 587,118
Curtain pole, E. K. West 587,166
Cutter. See Pipe cutter.
Dampers, counterbalance for, J. H. Cox 587,033
Die. See Printing die.
Diseases, apparatus for treating, H. Sanche 587,237
Distilling and aerating apparatus, F. Rosebrook 587,162
Ditching jack, R. Rue 587,274
Door stop, G. J. Markert 587,131
Draughting and plotting instrument, S. L. O'Neal 586,975
Electric furnace, G. De Chalmot 587,182
Electric machine, dynamo, S. W. Rushmore 587,164
Electric machine, multipolar dynamo, S. W. Rushmore 587,163
Electric machines, form for winding coils for dynamo, H. Geisenhoner 586,995
Electric meter, G. F. Packard 587,015
Elevator. See Grain elevator.
Elevator, Tucker & Corwin 587,049
Elevators, electrically operated locking device for, T. W. Jenkins 587,002
Elevators, mechanism for operating valves of hydraulic, W. F. Cole 586,990
Engine. See Carding engine Rotary steam engine.
Extractor. See Lemon juice extractor.
Eyeglass holder and cord attachment, W. D. Fennimore 587,192

(Continued on page 94)

USE OF HOT AIR IN DRYING.—BY E. M. Cook. A paper in which the author demonstrates the great economy of the use of hot air over that of steam for drying many materials, especially those in lumps, grain, or powder. With 3 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1022** and **1023.** Price 10 cents each. To be had at this office and from all newsdealers.

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(Continued on page 95)

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Shades, adjustable support for window, W. H. Bisbee	587,276
Shelf bracket, Lombard & Maynard	587,101
Shingle sawing machine, E. H. Kruger	587,215
Ship, E. Modersitzki	587,286
Signals, compensating attachment for semaphore, A. E. Eckert	587,145
Siphon, preserving, H. Levi	587,099
Speed indicator, recording, E. P. Decker	586,961
Speed regulator for motors, T. H. Macdonald	587,265
Square, T. M. B. Templin	587,021
Stamp, rotary hand, A. C. Adler	587,253
Stand. See Washtub stand.	
Starting gate, B. E. Harris	587,285
Steam generator, A. G. Hohenstein	587,148
Steam generators, water return system for, E. P. Holly	587,290, 587,291
Steel ingots, manufacture of, N. McConnell	587,105
Stopper. See Bottle stopper.	
Storm protector, G. W. Harmer	586,998
Stove and burner, vapor, Harvey & Munzer	587,036
Stove or furnace, downdraught, E. D. McLean (reissue)	11,623
Swing, N. Thomas	587,022
Switch. See Automatic switch.	
Table, Busch & Miller	587,181
Tacks, assembling and transferring device for use in moulding coverings upon heads of, A. C. Estabrook	587,117
Telautograph, L. O. McPherson	587,013
Telephone exchange, M. G. Kellogg	587,004
Telephone exchange apparatus, F. R. McBerty	587,081
Telephone switchboards, calling appliance for, F. R. McBerty	587,080
Telephone system, Dillberg & Rabbidge	586,993
Telephone trunk circuit, J. J. O'Connell	587,226
Telephony, J. W. Gibboney	587,119, 587,120
Thimble, L. Holcomb	587,123
Thread guide, C. Koffinke	587,098
Tilework, D. N. Lanyon	587,263
Tire, W. D. Snow	587,244
Tire, non-puncturable bicycle, J. A. O'Dell	587,227
Tire, pneumatic A. H. Crockford	587,075
Tire, pneumatic, L. J. M. Loisel	587,009
Tire setting machine, P. D. Dupont	587,035
Tire tightener, J. G. Sarter	587,238
Tires, means for closing leaks in pneumatic, F. J. & G. W. Jones	587,211
Tobacco, preparing smoking, J. Cohen	587,184
Track sanding device, F. Mertsheimer	587,103
Trap. See Animal trap.	
Trimmer. See Finger nail trimmer. Welt trimmer.	
Trolley, A. S. Krotz et al	587,214
Trolley wheel fork, S. B. Thompson	587,047
Trousers clamp for bicycle riders, L. P. Converse	587,280
Truck, car, J. A. Brill	586,987
Truck, car, M. F. Noeconk	587,060
Typewriter, A. R. Bailey	587,288
Typewriting machine, T. H. Stackhouse	587,020
Valve, M. R. Sherrerd	587,107
Valve, air brake tripple, J. T. & G. W. Hayden	587,054
Valve, combined pressure and vacuum, H. Goehring	587,094
Valve connection for steam engines, J. Young	587,168
Valves in pipes or mains, means for inserting, D. W. French	587,092
Valves in pipes or mains, means for inserting, M. R. Sherrerd	587,108
Vehicle draught attachment, A. MacAlpine	587,078
Vehicle seat, J. Q. Black	587,175
Vehicle wheel, W. T. Faizey	587,191
Velocipede, C. E. Beckman	587,051
Velocipedes, pneumatic or cushion wheel for, Bevan & James	587,174
Ventilator, T. R. Harper	587,259
Vibrating or gyrating device, H. K. Nold	587,156
Voting machine, Hardie & Post	587,129
Voting machine, mechanical, J. A. Markoe	587,222
Wagon brake, A. W. Burkholder	587,180
Wagon brake, automatic, H. A. Hibbard	586,969
Warp chains, machine for wrapping, E. T. Garsed	587,194
Washtub stand, H. & A. Maes	587,219
Watch, stem winding and setting, O. Ohlson	587,158
Water, etc., hydraulic apparatus for raising or forcing, H. D. Pearsall	587,063
Water meter, A. H. Kennedy	587,125
Waterproof material, A. L. Kennedy	587,096
Waxing pad, E. E. Woisard	586,985
Welt trimmer, A. F. Chandler	587,279
Wheel. See Bicycle spring wheel. Vehicle wheel.	
Wire holder, J. B. Lawrence	587,216
Wrench. See Nut wrench.	
Wrench, C. Crumpler	587,186

DESIGNS.

Badge, A. F. Thompson	27,419
Badge pin, G. E. Darling	27,420
Bicycle frame, T. S. Culp	27,438
Bicycles, wall support for, H. L. Piper	27,439
Carpet, J. S. Wishart	27,449, 27,450
Fencing, pattern for wire, A. L. Kitselman	27,435
Frying pan, R. Dean	27,436
Game board, D. Kogler	27,443
Game board, Smith & Hamilton	27,444
Gearing cover, J. S. Copeland	27,437
Girdle, W. H. Starr	27,422
Glass, surface ornamentation of, Brogan & Malloch	27,445 to 27,447
Golf ball, W. Dunn	27,441
Hairpin, A. Knippenberg	27,423
Horseshoe calk, S. C. Jones	27,429
Lock plate, R. W. Owen	27,428
Motors, shell for electric, H. E. Heath	27,433
Nose clamp, L. Ray	27,424
Nut lock, C. C. Purdy	27,427
Plows, cutter attachment for, J. C. Ball	27,434
Propeller, screw, G. H. Beck	27,432
Shade bracket, window, Walters & Brown	27,426
Snap hook, Wright & Dieterich	27,425
Stockings, top for golf, T. M. Twomey	27,440
Sugar cane hook, G. A. Beall	27,430
Toy bank, M. A. Martin	27,442
Trimming, I. A. Schwarz	27,448
Truck frame, metallic, L. J. Cox	27,431
Watch charm, etc., S. Stophlet	27,421

TRADE MARKS.

Bicycles, Thomas Manufacturing Company	30,447
Bicycles and other velocipedes, Clement, Gladiator & Humber (France)	30,448
Bicycles, tricycles, tandems and goods of identical character, Speeder Cycle Company	30,449
Books, pamphlets, paper and envelopes, American National Red Cross	30,428
Canned meats, fruits and dairy products, such as butter and cheese, H. P. Somers	30,433
Cement, roofing, F. W. Turpin	30,443
Coal derivatives, Gas Light and Coke Company	30,440
Crabs, lobsters, turtles, frogs, oysters and fish, fresh and processed, C. H. Lighthiser	30,432
Enamels, Chicago Varnish Company	30,441
Engine indicator, steam, Crosby Steam Gage and Valve Company	30,451
Gum, chewing, Grove Company	30,434
Liniment for horses and other animals, Cecconello & Canapa	30,446
Linings, cotton, F. A. Foster & Company	30,430
Pencils, pencil attachments, pens and other stationery, Blaisdell Paper Pencil Company	30,429
Plaster and finish, wall, Zenith Wall Plaster and Finish Company	30,444
Poison, rat, Newton Manufacturing and Chemical Company	30,445
Pulley coating, Little & Schoetz Pulley Coating Company	30,442
Rice powder, toilet, Roger & Gallet	30,439
Starch, laundry, W. R. Donovan	30,431
Steam traps, feed water heaters, steam and oil separators, exhaust pipe heads and low water alarms, A. A. Griffing Iron Company	30,450
Toilet preparations, including soap, dentifrice and hair restoratives, Roger & Gallet	30,437, 30,438
Whisky, Rosskam, Gerstley & Company	30,435
Whisky, wines, gins and brandies, Rosskam, Gerstley & Company	30,436

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"Francis Original and Only Silk Molasses Candy," J. H. Francis, Jr.	6,551
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